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QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	**COLLECTION OF AMBIENT AIR QUALITY AND METEOROLOGICAL MONITORING DATA**
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1.0 PURPOSE AND APPLICABILITY

This standard operating procedure (SOP) outlines the steps taken by the National Park Service (NPS) Air Resources Division's (ARD) Information Management Center (IMC) for collecting ambient air quality and meteorological data from network sites. These data include:

- Criteria pollutant parameters
- Meteorological data parameters
- Diagnostic parameters and calibration data

2.0 RESPONSIBILITIES

2.1 DATA COORDINATOR

The data coordinator shall on a daily basis:

- Set up the automatic data collection programs and batch jobs.
- Provide technical support to the site operator via telephone.
- Determine when it is necessary to use data from daily printouts, strip chart output, or third-party sources.
- Review the automatic data collection process with the data technician to assure the integrity of the data collection.

2.2 DATA TECHNICIAN

The data technician shall:

- Place the batch processing workstation in batch mode for daily data poll.
- Review the status of the automatic data collection each morning to achieve complete, error-free data collection and to assure the integrity of the monitoring systems.
- Perform required daily retries.
- Review ASCII files.
- Manually enter data from daily printouts, strip chart output, or third-party sources as directed.

2.3 FIELD SPECIALIST

The field specialist shall:

- Provide assistance to the IMC for troubleshooting data collection problems.
- Assist the site operator in troubleshooting on-site instrument problems.

2.4 SITE OPERATOR

The site operator shall:

- Telephone the IMC or field specialist if data collection problems occur.
- Provide on-site assistance for troubleshooting data collection problems.
- When required, download data to a temporary storage module and take the module to a location where a modem is available.

3.0 REQUIRED EQUIPMENT AND MATERIALS

The IMC requires the following hardware and software to collect data from dataloggers via telephone modems or from storage modules either via telephone modem or directly:

- IBM-PC compatible Pentium computer system with SVGA and 600MB hard disk
- Hayes compatible modem configured for COM2
- MS-DOS
- Novell networking client software NETX.EXE
- *SITECALL* programs for collection of criteria pollutant and meteorological data
- Crosstalk Mk.4 software for telephone modem collection
- PS-Print batch processing software
- SUMX and Odessa datalogger storage module interface
- Site configuration information maintained in the Air Quality Database Management System (AQDBMS).

Ambient air quality and meteorological monitoring stations generally require and are configured with the following equipment:

- SUMX, Odessa, or ESC datalogger

- Telephone modem
- Strip chart recorder
- Dot matrix printer
- Portable storage module at sites where telephone liens are not directly available.

4.0 METHODS

In order to assure complete, error-free data collection, data are usually logged on-site by a SUMX, Odessa, or ESC datalogger and collected via telephone modem (see the Data Acquisition section of Figure 4-1). Occasionally, telephone lines to a site are not available or data cannot be directly collected by modem due to problems such as modem malfunction or bad telephone lines. The second preferred method of data collection is to download data from the datalogger to a portable storage module. The module is then taken to a location with a modem or sent directly to the IMC. Again, problems may prevent acquiring data in this way. The IMC will then attempt to recover data from daily printouts of the data collected by the site operator and forwarded to the IMC or from strip chart recorders. As a last resort, suitable data from third parties may be used.

To summarize, the IMC collects data by one of these methods:

- From a datalogger via telephone modem
- From a data storage module via telephone modem or directly
- From daily data printouts
- Reduced from strip chart recorder output
- Digital transmission from a third-party source

For detailed instructions on each method of data acquisition, refer to the following technical instructions (TIs):

- TI 3350-4000, *Collection of Ambient Air Quality and Meteorological Data via Telephone Modem*
- TI 3350-4002, *Collection of Ambient Air Quality and Meteorological Data via Storage Module*
- TI 3450-5000, *Ambient Air Quality and Meteorological Data - Level-0 Validat*ion, Section 4.3.5, Entering Data From Daily Printouts and Strip Charts, and Section 4.3.6, Loading Data From a Third-Party Source.

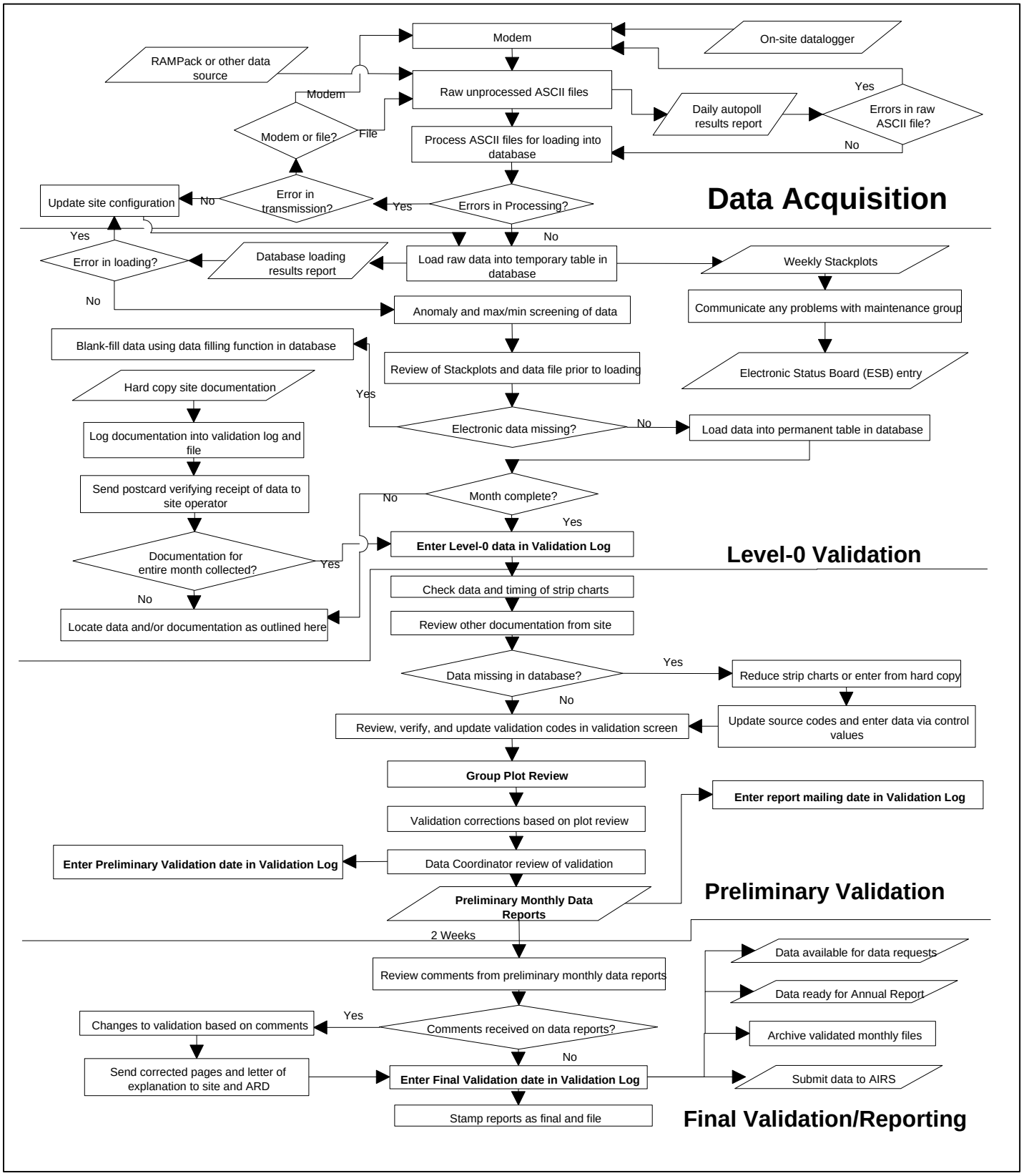

Figure 4-1. NPS Ambient Air Quality and Meteorological Monitoring Network Data Collection, Validation, and Reporting Flow Diagram.

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QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
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QA MANAGER	Gloria S. Mercer	
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1.0 PURPOSE AND APPLICABILITY

This technical instruction (TI) describes the steps taken by the National Park Service (NPS) Air Resources Division's (ARD) Information Management Center (IMC) for collecting ambient air quality and meteorological data via telephone modems. The primary purpose of daily collection is to assure quality data capture and minimize data loss by:

- Calling the datalogger at each station via telephone modem and downloading the past day's data into site-specific daily files.
- Reformatting the raw datalogger files for loading into the Air Quality Database Management System (AQDBMS) Oracle database.
- Reviewing the daily error and diagnostic printouts to verify complete data collection and to identify problems.

As referenced from Standard Operating Procedure (SOP) 3350, *Collection of Ambient Air Quality and Meteorological Monitoring Data*, this TI is a guide for using the SITECALL data collection software under MS-DOS to assure complete, error-free data collection from SUMX, Odessa, or ESC dataloggers via telephone modems.

This TI assumes the operator has basic knowledge of IBM-PC compatible personal computers, the MS-DOS operating system, and Microsoft Windows95.

2.0 RESPONSIBILITIES

2.1 DATA COORDINATOR

The data coordinator shall on a daily basis:

- Set up the automatic data collection programs and batch jobs.
- Provide technical support to the site operator via telephone.
- Review the automatic data collection process with the data technician to assure the integrity of the data collection.

2.2 DATA TECHNICIAN

The data technician shall:

- Place the batch processing workstation in batch mode for daily data poll.
- Review the status of the automatic data collection each morning to achieve complete, error-free data collection and to assure the integrity of the monitoring systems.
- Perform required daily retries.
- Review ASCII files.

2.3 FIELD SPECIALIST

The field specialist shall:

- Provide assistance to the IMC for troubleshooting data collection problems.
- Assist the site operator in troubleshooting on-site instrument problems.

2.4 SITE OPERATOR

The site operator shall:

- Telephone the IMC or field specialist if data collection problems occur.
- Provide on-site assistance for troubleshooting data collection problems.

3.0 REQUIRED EQUIPMENT AND MATERIALS

The IMC requires the following hardware and software to collect data from dataloggers via telephone modems:

- IBM-PC compatible Pentium computer system with SVGA and 600MB hard disk
- Hayes compatible modem configured for COM2
- MS-DOS
- Novell networking client software NETX.EXE
- *SITECALL* programs for collection of criteria pollutant and meteorological data
- Crosstalk Mk.4 software for telephone modem collection
- PS-Print batch processing software
- SUMX and Odessa datalogger storage module interface
- Site configuration information maintained in the Air Quality Database Management System (AQDBMS).

Ambient air quality and meteorological monitoring stations generally require and are configured with the following equipment:

- SUMX, Odessa, or ESC datalogger
- Telephone modem

- Strip chart recorder
- Dot matrix printer
- Portable storage module at sites where telephone liens are not directly available.

4.0 METHODS

This section includes five (5) major subsections:

4.1 Automatic Data Acquisition
4.2 Retry of Failed Data Collection Sites
4.3 Daily ASCII File Review
4.4 Manual Data Collection via Telephone Modem From Datalogger
4.5 Daily Review of Data Folder Contents

4.1 AUTOMATIC DATA ACQUISITION

Data are automatically collected via telephone modem from current monitoring sites using the *SITECALL* batch routine. The list of current monitoring sites and specific information needed to poll each site is maintained in the AQDBMS Site Configuration Table. See SOP ____, *Data Coordinator's Maintenance Responsibilities in the AQDBMS*, for instructions on modifying or adding to this table.

Data are collected daily unless extenuating circumstances require an alternative collection schedule. The MS-DOS *SITECALL* software performs the following tasks:

- Polls each telephone modem daily
- Reformats the transmitted data into appropriate data files:
    - Raw logger output file
    - Cleaned logger output file
    - Reformatted, tabular data file to be read by the Oracle loader utility
    - Reformatted, tabular data file for diagnostic plots
    - Reformatted calibration results file to be read by the Oracle loader utility
- Creates diagnostic log and error files that are automatically printed:
    - Error file
    - Summary data capture report
    - Summary datalogger time report
    - Span file

4.1.1 Setting Up the Automatic Data Polling Routine

The automatic polling routine is controlled by batch jobs submitted to a batch processing software queue on the computer network. The batch job file contains a variety of parameters that define how and when the polling program executes. The batch job submittal process has been standardized using the MS-DOS batch file: \\ars_net3\vol2\project\npsair\sitecall\newbatch.bat, which assumes a daily data collection schedule.

To set up the batch job:

- Log onto the network file server.
- Enter the "NEWBATCH" command with the time and date data collection is to occur:

  NEWBATCH hh:mm mm/dd/yy

  Where hh:mm = time of day that daily data pull is to occur
  mm/dd/yy = month/day/year of the first daily pull

  For example, enter **NEWBATCH 03:05 06/01/97** to set up the first data collection to occur at 3:05 a.m. on June 1, 1997.

4.1.2 Daily Startup of the Batch Data Polling Program

Each day, a PC is set up to execute the daily data collection job that has been previously established in the batch queue by the NEWBATCH command.

To startup the batch polling program:

- Turn on the PC and login onto the network as user **BATCH.**
- Enter the password when prompted.
- At the next prompt, select **3** - NPSAIR DPC sitecall daily batch server.
- Leave the PC on.

The batch program will execute at the assigned time and save the data to disk. For each current monitoring site, the automatic data polling routine includes an initial call and two immediate retries if the first call is unsuccessful.

4.1.3 IMC Daily Site Call Diagnostic Reports

When the automatic daily calls have been completed, the following diagnostic reports are automatically printed:

- A daily diagnostic message report (AQmmddyy.MES)

- A *SITECALL* error report (AQmmddyy.ERR)
- A summary/span report (AQmmddyy.SPN)

The Network Maintenance Group receives the summary/span report and the IMC collects and examines the message and error reports. Examples of each report are shown in Figures 4-1 through 4-3. The data collection diagnostic reports are collected in a three-ring binder for each month with dividers for each day. Four notebooks are kept with four consecutive months and are rotated throughout the year. At any time, one notebook will contain the daily calling information for the current month, and the other three will have the three previous months. These reports are kept until all data for a month is at final validation level. Labels on the outside of the notebooks are changed to reflect the month that is currently in the notebook.

4.1.4 Data Error Checking

Since the presence of error-checking modems is inconsistent throughout the NPS network, additional error checking must be performed in the *SITECALL* program. The first level of error checking occurs in the reformatting batch routine. The routine first checks for unacceptable ASCII characters and characters that are out of alignment. The routine checks for two levels of errors. One error level is non-fatal and it may be possible to reprocess these data with caution after editing the file. Fatal errors prevent the data from reprocessing successfully and a message is printed to the error file. If a fatal error occurs, the site must be recalled and the data collected until it is error-free.

Occasionally, data errors prove difficult to troubleshoot. A detailed description of the error is listed in the *SITECALL* error report (AQmmddyy.ERR) that is generated by each batch job. A data analyst or applications programmer may need to examine this file in a text editor for additional diagnostic information to find the problem.

4.2 RETRY OF FAILED DATA COLLECTION SITES

The results of the daily data collection are automatically printed at the completion of the polling process. The data technician compares the AQmmddyy.ERR error report against the current site checklist (Figure 4-4) to determine which sites failed to be polled. The *SITECALL* program creates a daily retry file of sites that may have failed. The data technician examines the automatic collection results carefully and verifies the contents of the retry file. Sites with data errors not listed in the error printout are entered in the *RETRY* command.

The retry file is named “AQmmddyy.ret” where mmddyy is the date of data collection. It is read automatically and should not be edited or otherwise modified unless the *RETRY* program requests a modification. The *RETRY* program reads the specified retry file to recall the failed sites.

```
AQREFORM - Fatal reformat error opening a file - EVER0208.98C
AQREFORM - Reformat aborted
AQREFORM - Site EVER written to retry file.
AQREFORM - Fatal error during reformat of EVER0208.98C .



AQREFORM - Fatal reformat error opening a file - EVER0208.98C
AQREFORM - Reformat aborted
AQREFORM - Site EVER written to retry file.
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AQREFORM - Reformat aborted
AQREFORM - Site EVER written to retry file.
AQREFORM - Fatal error during reformat of EVER0208.98C .
```

Figure 4-1. Example Daily Diagnostic Message Report.

```
NPS Automatic Site Call & Data Collection
Beginning autopoll at 02:21:48p on 02-09-98
Xtalk dialing directory = npssites
Call list file          = npssites.lst
Diagnostic output file  = AQ020898.MES
Error output file       = AQ020898.ERR
Summary span file       = REVIEW\AQ020898.SPN
Retry output file       = AQ020898.RET

**********************************************

 SITECALL - SHBM failed - 02-09-98  02:22:06p -
            3 unsuccessful attempts - modem error.

 AQREFORM - Fatal reformat error opening a file - EVER0208.98C

 AQREFORM - Fatal error during reformat of EVER0208.98C .

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 AQREFORM - Fatal reformat error opening a file - EVER0208.98C

 AQREFORM - Fatal error during reformat of EVER0208.98C .
```

Figure 4-2. Example Daily Sitecall Error Report.

```
NPS Automatic Site Call & Data Collection
Beginning autopoll at 03:10:03a on 03-05-98
Xtalk dialing directory = npssites
Call list file          = npssites.lst
Diagnostic output file  = AQ030498.MES
Error output file       = AQ030498.ERR
Summary span file       = REVIEW\AQ030498.SPN
Retry output file       = AQ030498.RET

Span/diagnostic information
*********************************************************************


 Data or header incomplete in SHBM0304.98C
 Site SHBM written to retry file.
 Fatal error during reformat of SHBM0304.98C .
 ---------------------------------------------------------------


   EVERGLADES NP          63   980304
-----------------------------------------------------------------

Logger time x-check
Polling time for EVER  - 03:12:07a 03-05-98
Data logger time       - 05:11:36  03/05/98

CALIBRATION-RESULTS
COLUMNS # & NAME    LEVEL 0   LEVEL 1   LEVEL 2   LEVEL 3   LEVEL 4   LEVEL 5
01  O3   ACTUAL         -1C       -9                                     410C
         THEORETICAL     0        90                                     400
02 CAL   ACTUAL         -1C      -19                                     419C
         THEORETICAL     0        90                                     400


 OPERATOR MESSAGES FOLLOW:
LAST MESSAGE     15:12:45  02/24/98    55
ERIC ARE YOU IN THE SHELTER? MARTIN ARS.
LAST MESSAGE     13:51:21  02/02/98    33
OK i'M I  NOW. HOPE THE NEW PHONE LINE WORKS!  JF
LAST MESSAGE     10:09:44  12/11/97   345
OK IM IN
LAST MESSAGE     17:26:02  11/21/97   325
ii
 Processing of EVER0304.98C complete.
 ---------------------------------------------------------------
```

Figure 4-3. Example Daily Summary/Span Report.

NPS DAILY SITE CALL CHECK/RETRY LIST

Date: 1/25/98

Site Abb.	Completed	Recall Reason	Discoveries/Comments
[illegible]	1/26	Sumx response	
[illegible]		Modem error	[illegible]
Lavo	1/26	Sumx response	
Selk		Sumx	Connects- [illegible] download.
noca	1/26	data incomplete	[illegible] line.

	Notes	Time Zone	Call/ Not Call	Site Abbrev.	Site Name	Telephone Number	Password	Data Logger Type
		1	1	EVER	Everglades	1-305-242-7838	EVERSX	sumx
		1	-1	GSCD	GS Clingmans Dome	1-423-567-6802	GRSMCD	sumx
		1	1	GSCM	GS Cove Mountain	1-423-428-9948	GRSMCM	sumx
		1	-1	GSCC	GS Cades Cove	1-423-448-9521	GRSMCC	sumx
		1	1	GSLR	GS Look Rock	1-423-977-1485	GRSMLR	sumx
		1	1	MAHM	Mammoth Cave	1-502-646-7241	MACASX	sumx
		1	1	SHBM	SHEN Big Meadows	1-540-999-3698		odessa
		2	1	BIBE	Big Bend	1-915-477-2258	BIBESX	sumx
		2	1	VOYS	Voyageurs	1-218-244-9894	VOYASX	sumx
		3	1	CANY	Canyonlands	1-801-259-4141	CANYSX	sumx
		3	1	CHIR	Chiricahua	1-602-824-3660		odessa
		3	1	CRMO	Craters of the Moon	1-208-527-3279	CRMOSX	sumx
		3	1	GLAC	Glacier	1-406-888-5744		odessa
		3	1	MEVE	Mesa Verde	1-303-749-2533	MEVESX	sumx
		3	1	ROMO	Rocky Mountain	586-8520	ROMOSX	sumx
		3	1	YELW	Yellowstone	1-307-242-2410	YELLSX	sumx
		4	1	DEVA	Death Valley	1-619-786-2497	DEVASX	sumx
		4	1	GRBA	GREAT BASIN	1-702-234-7104	GRBASX	sumx
		4	1	GRCA	Grand Canyon	1-602-638-2031		odessa
		4	1	JOYV	Joshua Tree	1-619-228-1927	JOTRSX	sumx
		4	1	LAVO	Lassen Volcanic	1-916-335-7214	LAVOSX	sumx
		4	1	MORA	Mount Rainier	1-360-569-8802	MORASX	sumx
		4	1	NOCA	North Cascades	1-360-873-2054	NOCASX	sumx
		4	1	OLYM	Olympic	1-360-452-5684	OLYMSX	sumx
		4	1	PINN	Pinnacles	1-408-389-4586	PINNSX	sumx
		4	[illegible]	SELP	SEK Lookout Point	[illegible]	SEKILP	sumx
		4	1	SELK	SEK Lower Kaweah	1-209-565-3490	SEKILK	sumx
		4	1	YOTD	YOSE Turtleback Dome	1-209-	YOSETD	sumx
		5	1	DENA	Denali	1-907-683-9638	DENASX	sumx
		5	1	HAVO	Hawaii Volcanoes	1-808-967-8652	HAVOSX	sumx

Figure 4-4. An Example of a Current Site Checklist.

To run the *RETRY* program:

- Go to an MS-DOS prompt.
- Enter **RETRY mmddyy** where mmddyy is the date of the data to be retried. The sites that require a retry are listed on screen.
- When prompted, enter the four-character site-code of additional sites that need to be retried.

The program then calls the list of sites to retry and stores data files in the \\ars_net3\vol2\project\npsair\sitecall\3 folder. Each retry job prints an updated diagnostic summary reflecting the updated status of all sites for the day's data collection. Once the data files are correctly polled, the data technician manually moves the file from the \\ars_net3\vol2\project\npsair\sitecall\3 folder to the \\ars_net3\vol2\project\npsair\sitecall\1 folder.

4.3 DAILY ASCII FILE REVIEW

Data from the daily data files are automatically reformatted and written to the following files:

ssssmmdd.yyO
ssssmmdd.yyR
ssssmmdd.yyC
ssssmmdd.yy.D
ssssmmdd.yy.L

Where:	ssss	= the four-letter site abbreviation
	mmdd	= the calendar month and day
	yy	= the year
	O	= the Odessa datalogger format data file
	R	= the SUMX datalogger format data file (may also be a converted Odessa data file)
	C	= cleaned file (ASCII clean up)
	D	= data reformatted in tabular format ready for loading into the database. Some data screening has been performed in this reformat process
	L	= daily calibration data written to tabular format including daily zero and span values and weekly precision data for loading into the database.

Examples of each type of file are shown in Figures 4-5 through Figure 4-9.

```
Polling time for GLAC  - 03:33:55a 03-03-98
?
T
TIME IS  03:33:58    0062  GNP 168     03/02/98
1
03:3C

                        CALIBRATION RESULTS
                          NONE  CONDUCTED
1

03:34:10  0061  01  GNP 168     03/02/98
============================================================*****
          01     02     03     04     05     06     07     08
CHAN    RAIN    WDR    WSP   TEMP DELTMP RELHUM  OZONE O3 CAL   SD1
UNITS INCHES    DEG    M/S  DEG C  DEG C      %    PPB    PPB   DEG
FSCL   10.00    360   50.0   50.0   7.00  100.0    496   1000  99.9
ZERO    0.00      0    0.0  -50.0  -3.00    0.0    -04      0  00.0
============================================================*****
01:00   0.00    137    0.3    0.3   0.25   82.4     15     00  62.1
02:00   0.00     60    0.4   -0.9   0.21   85.6     13     00  57.6
03:00   0.00     68    0.4   -2.0   0.35   88.9     10     00  65.6
04:00   0.00    122    0.2   -2.3   0.31   90.7     06     00  46.8
05:00   0.00     83    0.3   -2.6   0.28   91.6     04     00  59.5
06:00   0.00     76    0.3   -3.5   0.38   92.4     06     00  47.3
07:00   0.00     58    0.3   -4.4   0.32   93.4     04     00  54.0
08:00   0.00    140    0.2   -4.6   0.47   94.0     01     00  70.9
09:00   0.00    239    0.2   -3.6   0.47   93.9     06     00  50.3
10:00   0.00    228    0.5   -1.7   0.50   89.9     15     00  35.0
11:00   0.00     50    1.3    2.0   0.36   74.4     26     00  55.0
12:00   0.00     34    1.1    4.0   0.25   64.8     30     00  47.5
13:00   0.00     27    1.2    5.9   0.40   58.3     32     00  53.0
14:00   0.00     34    1.3    7.9   0.50   50.6     33     00  52.4
15:00   0.00     21    0.9    9.1   0.56   45.1     33     00  62.6
16:00   0.00     36    1.3    9.2   0.77   45.1     33     00  39.7
17:00   0.00    298    0.3    8.5   1.22   48.2     32     00  49.7
18:00   0.00    205    0.7    7.6   2.25   54.9     29     00  44.9
19:00   0.01    257    4.5    6.6   0.76   72.6     34     00  14.7
20:00   0.06    243    1.2    3.9   0.47   88.5     27     00  61.8
21:00   0.06    171    0.3    2.8   0.71   94.9     16     00  56.8
22:00   0.03    212    0.6    2.3   0.38   96.4     16<    00< 38.1
23:00   0.04    359    0.1    1.7   0.64   96.8     12C   -01C 69.8
24:00   0.02    181    0.2    1.6   0.45   97.3     09     00  34.8

SUMMA   0.22 ------    0.7    2.0   0.55   78.8     19<    00<

=========================================
          09     10     11     12     13
CHAN  SOLRAD   FLOW  SCAWS WETNES    STP
UNITS   W/M2    LPM    M/S ON/OFF    DGC
FSCL    1396   4.88   50.0    100  100.0
ZERO       0    .00    0.0      0     .0
=========================================
01:00      00   3.00    0.6     01   24.2
02:00      00   3.00    0.6     01   24.2
03:00      00   3.00    0.6     01   24.3
04:00      00   3.00    0.4     01   24.3
05:00      00   3.00    0.5     01   24.3
06:00      00   3.00    0.4     01   24.3
07:00      00   3.00    0.5     01   24.4
08:00      09   3.00    0.4     01   24.4
09:00     106   3.00    0.5     01   24.4
10:00     171   3.00    0.6     01   24.3
11:00     320   3.00    1.6     01   24.2
12:00     273   3.00    1.5     01   24.3
13:00     492   3.00    1.7     01   24.4
14:00     564   3.00    1.7     01   24.4
15:00     392   3.00    1.3     01   25.0
16:00     222   3.00    1.5     01   24.8
17:00      92   3.00    0.8     01   24.0
18:00      14   3.00    1.0     01   24.3
19:00      00   3.00    4.5     01   24.2
20:00      00   3.00    1.6     01   24.3
21:00      00   3.00    0.7     01   24.2
22:00      00   3.00    0.6     01   24.3
23:00     -04   3.00    0.3     01   24.0
24:00      00   3.00    0.3     01   24.2

SUMMA     111   3.00    1.0     01   24.3

                          CALIBRATION RESULTS
ZERO/SPAN  PARAMETER   START   STOP   DAY   ACTUAL  EXPECTED   TYPE
  ZERO     07  OZONE   22:30  22:45  0061      -04       -04     I
  SPAN2    07  OZONE   22:00  22:30  0061      401       396     I
  ZERO     08 O3 CAL   22:30  22:45  0061      -03        00     I
  SPAN2    08 O3 CAL   22:00  22:30  0061      404       400     I
```

Figure 4-5. Example Odessa Datalogger Format Data File.

```
Polling time for DENA  - 04:18:32a 03-03-98
>:T
TIME  02:17:57  03/03/98    62
:::
CHARACTERS :    46
  CHECKSUM :  1798
>
?
>:1

PREVIOUS DAILY SUMMARY               03/02/98    61     DENALI NP
*******************************************************************************
COLUMN NUMBER        01      02      03      04      05      06      07      08
CHANNEL NUMBER       06      07      02      04      04      02      03      08
CHANNEL NAME         O3     CAL     VWD     VWS     SWS     SIG     TMP     DTP
CHANNEL UNITS       PPB     PPB     DEG     M/S     M/S     DEG     DGC     DGC
FULL SCALE VALUE    483     980     540    50.0    50.0     540    50.0    -5.0
ZERO VALUE          -17     -20       0      .0      .0       0   -30.0     5.0
INPUT RANGE           1       1       5       5       5       5       5       5
INPUT TYPE            S       S       S       S       S       S       S       S
-------------------------------------------------------------------------------
01:00                46      -1      12     1.0     1.0      19   -16.4     1.1
02:00                46      -1     344      .7      .7      29   -16.7     1.1
03:00                45      -1     259      .5      .7      34   -17.0      .9
04:00                43      -1      27      .1      .7      86   -17.9      .7
05:00                40      -1     256      .6      .8      40   -18.4      .8
06:00                34      -1     257      .6      .8      49   -18.3      .8
07:00                38      -1     250      .6      .7      35   -18.6     1.3
08:00                36      -1     294      .6      .8      44   -18.3     1.5
09:00                36      -1     315      .6      .9      56   -18.0     1.5
10:00                37      -1     159      .4      .7      56   -16.6     1.1
11:00                36      -1     155      .5      .8      44   -16.5      .3
12:00                37      -1     184      .6      .8      38   -15.0      .3
13:00                40      -1     130      .8     1.0      38   -11.3      .5
14:00                44      -1     136      .8     1.2      49    -9.7      .1
15:00                45      -1     169     1.0     1.2      49    -8.6      .1
16:00                45      -1     172     1.0     1.2      37    -8.2      .3
17:00                45      -1     221     1.3     1.4      22    -9.1      .2
18:00                44      -1     237      .6      .9      61   -10.5      .5
19:00                45      -1     324      .6      .7      34   -12.0     1.3
20:00                45      -1     298      .7      .8      31   -13.2     1.5
21:00                45      -1     339      .6      .6       8   -14.3     1.2
22:00                44      -1     354      .7      .7      14   -15.0     1.1
23:00              227C    222C     335      .6      .6       8   -15.9     1.4
00:00                43      -1     345      .8      .8      10   -16.5     1.5

AVERAGE              42<     -1<     262      .2      .9           -14.7      .9

*******************************************************************************
COLUMN NUMBER        09      10      11      12      13      14      15      16
CHANNEL NUMBER       05      99      13      11      15      17      09      19
CHANNEL NAME        SOL     RNF     STP     FLW      RH     WET     PWR     REF
CHANNEL UNITS       WMS      MM     DGC     LPM       %     +/-     VAC     MVT
FULL SCALE VALUE   1396   200.0   100.0    5.49     100     100     500    1000
ZERO VALUE            0      .0      .0     .00       0       0       0       0
INPUT RANGE           5               1       5       5       1       5       1
INPUT TYPE            S               D       D       D       D       D       D
-------------------------------------------------------------------------------
01:00                 0      .0    22.5     .00      74     102     117    1024
02:00                 1      .0    22.6     .00      75     102     117    1024
03:00                 1      .0    22.5     .00      76     102     117    1024
04:00                 1      .0    22.6     .00      77     102     117    1024
05:00                 1      .0    22.6     .00      79     102     117    1024
06:00                 0      .0    22.6     .00      81     102     117    1024
07:00                 1      .0    22.4     .00      83     102     116    1024
08:00                 1      .0    22.4     .00      85     102     116    1024
09:00                24      .0    22.4     .00      86     102     115    1024
10:00               137      .0    22.5     .00      85     102     116    1024
11:00               130      .0    22.4     .00      82     102     116    1024
```

Figure 4-6. Example SUMX Datalogger Format Data File (May Also be a Converted Odessa Data File).

```
12:00               152      .0    22.5     .00      80     102     116    1024
13:00               347      .0    22.7     .00      77     102     116    1024
14:00               299      .0    23.0     .00      74     102     116    1024
15:00               220      .0    23.3     .00      74     102     117    1024
16:00               173      .0    23.4     .00      73     102     117    1024
17:00                82      .0    23.2     .00      72     102     116    1024
18:00                29      .0    23.1     .00      73     102     116    1024
19:00                 3      .0    22.9     .00      75     102     116    1024
20:00                 1      .0    22.7     .00      78     102     116    1024
21:00                 1      .0    22.7     .00      80     102     116    1024
22:00                 1      .0    22.7     .00      82     102     116    1024
23:00                 1      .0    22.7     .00      84     102     117    1024
00:00                 1      .0    22.6     .00      87     102     117    1024

AVERAGE              67      .0    22.7     .00      79     102     116    1024


CALIBRATION-RESULTS
COLUMNS # & NAME    LEVEL 0   LEVEL 1   LEVEL 2   LEVEL 3   LEVEL 4   LEVEL 5

01  O3   ACTUAL          3C      -17                                       405C
         THEORETICAL     0        90                                       400

02 CAL   ACTUAL          3C      -20                                       410C
         THEORETICAL     0        90                                       400
:::
CHARACTERS :  6579
  CHECKSUM :  6976
>:F
POWER FAILURES              02:19:19  03/03/98    62     DENALI NP

       FROM                            TO
01   15:54:13  01/08/98    8       15:54:19  01/08/98    8
02   15:42:24  01/08/98    8       15:42:30  01/08/98    8
03   11:41:58  12/27/97  361       11:42:03  12/27/97  361
04   02:40:48  12/19/97  353       02:40:56  12/19/97  353
05   14:09:06  12/18/97  352       14:38:12  12/18/97  352
06   09:38:34  12/11/97  345       11:30:36  12/11/97  345
07   10:35:12  12/09/97  343       10:35:42  12/09/97  343
08   10:34:17  12/09/97  343       10:34:39  12/09/97  343
09   11:03:09  12/06/97  340       13:51:14  12/06/97  340
10   13:43:53  12/05/97  339       13:51:51  12/05/97  339
:::
CHARACTERS :   791
  CHECKSUM :  2518
>
?
>L
LAST MESSAGE     16:20:32  02/11/98    42
(cont) contact Midori Raymore at (907) 683-9541.  Thanks, AJB
LAST MESSAGE     16:17:47  02/11/98    42
Station check 1545-1617. If problems @ Denali site now to 2/28, please
LAST MESSAGE     09:19:03  02/05/98    36
Multipoint calibration 2/4/98, 1610-1720. AJB
LAST MESSAGE     16:41:34  02/03/98    34
Station check 1528-1641. AJB
>!
PASSWORD :
```

Figure 4-6 (Continued). Example SUMX Datalogger Format Data File (May Also be a Converted Odessa Data File).

```
Polling time for DENA  - 04:18:32a 03-03-98
>:T
TIME  02:17:57  03/03/98    62
:::
CHARACTERS :    46
  CHECKSUM :  1798
>
?
>:1
PREVIOUS DAILY SUMMARY                03/02/98    61     DENALI NP
********************************************************************************
COLUMN NUMBER        01      02      03      04      05      06      07      08
CHANNEL NUMBER       06      07      02      04      04      02      03      08
CHANNEL NAME         O3     CAL     VWD     VWS     SWS     SIG     TMP     DTP
CHANNEL UNITS       PPB     PPB     DEG     M/S     M/S     DEG     DGC     DGC
FULL SCALE VALUE    483     980     540    50.0    50.0     540    50.0    -5.0
ZERO VALUE          -17     -20       0      .0      .0       0   -30.0     5.0
INPUT RANGE           1       1       5       5       5       5       5       5
INPUT TYPE            S       S       S       S       S       S       S       S
--------------------------------------------------------------------------------
01:00                46      -1      12     1.0     1.0      19   -16.4     1.1
02:00                46      -1     344      .7      .7      29   -16.7     1.1
03:00                45      -1     259      .5      .7      34   -17.0      .9
04:00                43      -1      27      .1      .7      86   -17.9      .7
05:00                40      -1     256      .6      .8      40   -18.4      .8
06:00                34      -1     257      .6      .8      49   -18.3      .8
07:00                38      -1     250      .6      .7      35   -18.6     1.3
08:00                36      -1     294      .6      .8      44   -18.3     1.5
09:00                36      -1     315      .6      .9      56   -18.0     1.5
10:00                37      -1     159      .4      .7      56   -16.6     1.1
11:00                36      -1     155      .5      .8      44   -16.5      .3
12:00                37      -1     184      .6      .8      38   -15.0      .3
13:00                40      -1     130      .8     1.0      38   -11.3      .5
14:00                44      -1     136      .8     1.2      49    -9.7      .1
15:00                45      -1     169     1.0     1.2      49    -8.6      .1
16:00                45      -1     172     1.0     1.2      37    -8.2      .3
17:00                45      -1     221     1.3     1.4      22    -9.1      .2
18:00                44      -1     237      .6      .9      61   -10.5      .5
19:00                45      -1     324      .6      .7      34   -12.0     1.3
20:00                45      -1     298      .7      .8      31   -13.2     1.5
21:00                45      -1     339      .6      .6       8   -14.3     1.2
22:00                44      -1     354      .7      .7      14   -15.0     1.1
23:00              227C    222C     335      .6      .6       8   -15.9     1.4
00:00                43      -1     345      .8      .8      10   -16.5     1.5
AVERAGE              42<     -1<     262      .2      .9          -14.7      .9
********************************************************************************
COLUMN NUMBER        09      10      11      12      13      14      15      16
CHANNEL NUMBER       05      99      13      11      15      17      09      19
CHANNEL NAME        SOL     RNF     STP     FLW      RH     WET     PWR     REF
CHANNEL UNITS       WMS      MM     DGC     LPM       %     +/-     VAC     MVT
FULL SCALE VALUE   1396   200.0   100.0    5.49     100     100     500    1000
ZERO VALUE            0      .0      .0     .00       0       0       0       0
INPUT RANGE           5               1       5       5       1       5       1
INPUT TYPE            S               D       D       D       D       D       D
--------------------------------------------------------------------------------
01:00                 0      .0    22.5     .00      74     102     117    1024
02:00                 1      .0    22.6     .00      75     102     117    1024
03:00                 1      .0    22.5     .00      76     102     117    1024
04:00                 1      .0    22.6     .00      77     102     117    1024
05:00                 1      .0    22.6     .00      79     102     117    1024
06:00                 0      .0    22.6     .00      81     102     117    1024
07:00                 1      .0    22.4     .00      83     102     116    1024
08:00                 1      .0    22.4     .00      85     102     116    1024
09:00                24      .0    22.4     .00      86     102     115    1024
10:00               137      .0    22.5     .00      85     102     116    1024
11:00               130      .0    22.4     .00      82     102     116    1024
12:00               152      .0    22.5     .00      80     102     116    1024
```

Figure 4-7. Example Cleaned File (ASCII Clean Up).

```
13:00               347      .0    22.7     .00      77     102     116    1024
14:00               299      .0    23.0     .00      74     102     116    1024
15:00               220      .0    23.3     .00      74     102     117    1024
16:00               173      .0    23.4     .00      73     102     117    1024
17:00                82      .0    23.2     .00      72     102     116    1024
18:00                29      .0    23.1     .00      73     102     116    1024
19:00                 3      .0    22.9     .00      75     102     116    1024
20:00                 1      .0    22.7     .00      78     102     116    1024
21:00                 1      .0    22.7     .00      80     102     116    1024
22:00                 1      .0    22.7     .00      82     102     116    1024
23:00                 1      .0    22.7     .00      84     102     117    1024
00:00                 1      .0    22.6     .00      87     102     117    1024
AVERAGE              67      .0    22.7     .00      79     102     116    1024
CALIBRATION-RESULTS
COLUMNS # & NAME    LEVEL 0   LEVEL 1   LEVEL 2   LEVEL 3   LEVEL 4   LEVEL 5
01  O3   ACTUAL          3C       -17                                    405C
         THEORETICAL     0         90                                    400
02 CAL   ACTUAL          3C       -20                                    410C
         THEORETICAL     0         90                                    400
:::
CHARACTERS :  6579
  CHECKSUM :  6976
>:F
POWER FAILURES              02:19:19  03/03/98    62     DENALI NP
       FROM                           TO
01   15:54:13  01/08/98    8       15:54:19  01/08/98    8
02   15:42:24  01/08/98    8       15:42:30  01/08/98    8
03   11:41:58  12/27/97  361       11:42:03  12/27/97  361
04   02:40:48  12/19/97  353       02:40:56  12/19/97  353
05   14:09:06  12/18/97  352       14:38:12  12/18/97  352
06   09:38:34  12/11/97  345       11:30:36  12/11/97  345
07   10:35:12  12/09/97  343       10:35:42  12/09/97  343
08   10:34:17  12/09/97  343       10:34:39  12/09/97  343
09   11:03:09  12/06/97  340       13:51:14  12/06/97  340
10   13:43:53  12/05/97  339       13:51:51  12/05/97  339
:::
CHARACTERS :   791
  CHECKSUM :  2518
>
?
>L
LAST MESSAGE     16:20:32  02/11/98    42
(cont) contact Midori Raymore at (907) 683-9541.  Thanks, AJB
LAST MESSAGE     16:17:47  02/11/98    42
Station check 1545-1617. If problems @ Denali site now to 2/28, please
LAST MESSAGE     09:19:03  02/05/98    36
Multipoint calibration 2/4/98, 1610-1720. AJB
LAST MESSAGE     16:41:34  02/03/98    34
Station check 1528-1641. AJB
>!
PASSWORD :
```

Figure 4-7 (Continued). Example Cleaned File (ASCII Clean Up).

```
DENA DATE    TIME   O3        CAL       VWD       VWS       SWS       SIG       TMP       DTP
SOL       RNF       STP       FLW       RH        WET       PWR       REF
DENA DATE    TIME   PPB       PPB       DEG       M/S       M/S       DEG       DGC       DGC
WMS       MM        DGC       LPM       %         +/-       VAC       MVT
DENA DATE    TIME    483       980       540       50.0      50.0      540       50.0      -5.0
1396      200.0     100.0     5.49      100       100       500       1000
DENA DATE    TIME    -17       -20       0         .0        .0        0         -30.0     5.0
0         .0        .0        .00       0         0         0         0
DENA 980302     0   46.000    -1.000    12.000     1.000     1.000    19.000   -16.400     1.100
.000      .000    22.500     .000    74.000   102.000   117.000  1024.000
DENA 980302   100   46.000    -1.000   344.000      .700      .700    29.000   -16.700     1.100
1.000      .000    22.600      .000    75.000   102.000   117.000  1024.000
DENA 980302   200   45.000    -1.000   259.000      .500      .700    34.000   -17.000      .900
1.000      .000    22.500      .000    76.000   102.000   117.000  1024.000
DENA 980302   300   43.000    -1.000    27.000      .100      .700    86.000   -17.900      .700
1.000      .000    22.600      .000    77.000   102.000   117.000  1024.000
DENA 980302   400   40.000    -1.000   256.000      .600      .800    40.000   -18.400      .800
1.000      .000    22.600      .000    79.000   102.000   117.000  1024.000
DENA 980302   500   34.000    -1.000   257.000      .600      .800    49.000   -18.300      .800
.000      .000    22.600      .000    81.000   102.000   117.000  1024.000
DENA 980302   600   38.000    -1.000   250.000      .600      .700    35.000   -18.600     1.300
1.000      .000    22.400      .000    83.000   102.000   116.000  1024.000
DENA 980302   700   36.000    -1.000   294.000      .600      .800    44.000   -18.300     1.500
1.000      .000    22.400      .000    85.000   102.000   116.000  1024.000
DENA 980302   800   36.000    -1.000   315.000      .600      .900    56.000   -18.000     1.500
24.000      .000    22.400      .000    86.000   102.000   115.000  1024.000
DENA 980302   900   37.000    -1.000   159.000      .400      .700    56.000   -16.600     1.100
137.000      .000    22.500      .000    85.000   102.000   116.000  1024.000
DENA 980302  1000   36.000    -1.000   155.000      .500      .800    44.000   -16.500      .300
130.000      .000    22.400      .000    82.000   102.000   116.000  1024.000
DENA 980302  1100   37.000    -1.000   184.000      .600      .800    38.000   -15.000      .300
152.000      .000    22.500      .000    80.000   102.000   116.000  1024.000
DENA 980302  1200   40.000    -1.000   130.000      .800     1.000    38.000   -11.300      .500
347.000      .000    22.700      .000    77.000   102.000   116.000  1024.000
DENA 980302  1300   44.000    -1.000   136.000      .800     1.200    49.000    -9.700      .100
299.000      .000    23.000      .000    74.000   102.000   116.000  1024.000
DENA 980302  1400   45.000    -1.000   169.000     1.000     1.200    49.000    -8.600      .100
220.000      .000    23.300      .000    74.000   102.000   117.000  1024.000
DENA 980302  1500   45.000    -1.000   172.000     1.000     1.200    37.000    -8.200      .300
173.000      .000    23.400      .000    73.000   102.000   117.000  1024.000
DENA 980302  1600   45.000    -1.000   221.000     1.300     1.400    22.000    -9.100      .200
82.000      .000    23.200      .000    72.000   102.000   116.000  1024.000
DENA 980302  1700   44.000    -1.000   237.000      .600      .900    61.000   -10.500      .500
29.000      .000    23.100      .000    73.000   102.000   116.000  1024.000
DENA 980302  1800   45.000    -1.000   324.000      .600      .700    34.000   -12.000     1.300
3.000      .000    22.900      .000    75.000   102.000   116.000  1024.000
DENA 980302  1900   45.000    -1.000   298.000      .700      .800    31.000   -13.200     1.500
1.000      .000    22.700      .000    78.000   102.000   116.000  1024.000
DENA 980302  2000   45.000    -1.000   339.000      .600      .600     8.000   -14.300     1.200
1.000      .000    22.700      .000    80.000   102.000   116.000  1024.000
DENA 980302  2100   44.000    -1.000   354.000      .700      .700    14.000   -15.000     1.100
1.000      .000    22.700      .000    82.000   102.000   116.000  1024.000
DENA 980302  2200  227.000C  222.000C  335.000      .600      .600     8.000   -15.900     1.400
1.000      .000    22.700      .000    84.000   102.000   117.000  1024.000
DENA 980302  2300   43.000    -1.000   345.000      .800      .800    10.000   -16.500     1.500
1.000      .000    22.600      .000    87.000   102.000   117.000  1024.000
```

Figure 4-8. Example Data Reformatted in Tabular Format Ready for Loading into the Database.

```
DENA DATE    TIME  A_O3___L0 A_O3___L1 A_O3___L5 T_O3___L0 T_O3___L1
T_O3___L5 A_O3CALL0 A_O3CALL1 A_O3CALL5 T_O3___L0 T_O3___L1 T_O3___L5
DENA 980302  2300     .003C    -.017      .405C     .000      .090      .400
.003C    -.020      .410C     .000      .090      .400
```

Figure 4-9. Daily Calibration Data Written to Tabular Format Including Daily Zero and Span Values and Weekly Precision Data for Loading into the Database.

Raw and reformatted data files are written to \\ars_net3\vol2\project\npsair\sitecall\1. The *SITECALL* program also creates a *StackPlot* data file for each site stored in \\ars_net3\vol2\project\npsair\sitecall\review. The *StackPlot* data files are used to create weekly *Stackplots* as a tool in the data review and validation process (See TI 3450-5000, *Ambient Air Quality and Meteorological Data - Level 0 Data Validation*). The file naming convention is SSSS.DAT where SSSS is the four-letter site abbreviation.

If the *SITECALL* program works correctly, a new run-time *StackPlot* control file is created in the \\ars_net3\vol2\project\npsair\sitecall\review folder (Figure 4-10) that will plot the previous seven days of data. If a site does not process correctly, the data technician investigates the cause by examining the error and message files.

4.4 MANUAL DATA COLLECTION VIA TELEPHONE MODEM FROM DATALOGGER

If the *SITECALL* automatic data collection system is unable to correctly retrieve error-free data, the data technician manually retrieves as much data as possible as soon as possible using one of the following methods:

- Manual retrieval using communications software and manual logger commands
- Manual entry from daily data printouts collected by site operators and forwarded to the IMC
- Manual entry from strip charts

TI 3450-5000, *Ambient Air Quality and Meteorological Data - Level 0 Data Validation* details the steps of manual entry of data from daily data printouts and strip charts.

```
 &STKFILES
 DATA_DATE         = 'CALENDAR'
 DATA_FORMAT       = 'FREE'
 FILE_TAG          = T
 GMT_DIF           = 0
 INPUT_FILE        = 'DENA.DAT'
 MISSING           = -999.000000
 NUM_IN_FIELDS     = 16
 NUM_TO_GRAPH      = 16
 PERIOD            = 1.000000
 TIME_UNITS        = 'HOUR'
 /
 &PAGE_DEF
 FRAME_MARGIN      =      0.5

 MAIN_TITLE        = 'Denali National Park'
 N_PLOTS           =  1
 N_GRAPHS          = 8
 LAST_FIELD        = 16
 FIRST_FIELD       = 1

 BAR_WIDTH         = 0.000000E+00
 B_MARGIN          = 1.350000
 CHAR_CHH          = 6.000000E-02
 CLIP              = F
 COLOROP           = T
 DASH_OP           = T
 DATE_FORMAT       = 'MMDDYY'
 FOOTNOTE          =  'RAW DATA'
 FRAME             = F
 HOUR_INTERVAL     = 12
 HOUR_LABELS       = F
 LINE_WIDTH        = 1.000000
 L_MARGIN          = 1.2500000
 MAIN_CHH          = 1.000000E-01
 PLOT_DATE         = 'BOTH'
 PLOT_DOW          = T
 SYM_SIZE          = 2.000000E-02
 TIME_ZONE         = 'LST'
 TITLE_FONT        = 1
 TITLE_TOP         = T
 T_MARGIN          = 2.000000E-01
 WKID              = 1
 X_LABEL_INTERVAL  = 1
 X_PLOT_SIZE       = 6.000000
 X_TITLE_MARGIN    = .6
 YGRID             = T
 /
 &VAR_DEF
 INPUT_FIELD =           1           2           3           4          5          6          7            8           9
10          11          12          13          14         15          16
 FIELD_NAME  = 'SOL(w/m2)' 'STP(degC)' 'TMP(degC)' 'DTP(degC)' 'SWS(m/s)' 'VWS(m/s)' 'VWD(deg)'    'RNF(mm)' 'SDWD(deg)'
'WET(%on)'    'RH(%)' 'REF(mvt)' 'O3 CAL(ppb)' 'PWR(volts)' 'O3(ppb)' 'FLOW(L/min)'
 YMIN        =           0         15.0       -30.0        -5.0        0.0        0.0         0.0            0          0.0
0.0         0.0      650.0            0          70.0          0          0.5
 YMAX        =        1400         35.0         50.0         5.0       16.0       16.0       360.0           40        100.0
100.0       100.0     1050.0            200         150.0        100           4.5
 MAJOR_TIC   =         350          5.0         20.0         2.5        4.0        4.0        90.0           10         25.0
25.0        25.0      100.0             50          20.0          25           1.0
 LABEL_DEC   =           0           0           0           1          0          0          0            1           0
0           0           0           0           0           0          1
 LINE_COLOR  =           2           4           2           4          2          4          2            4           2
4           2           4           2           4           2          4
 LINE_TYPE   =          -1           1          -1           1         -1          1         -2            0          -1
1          -1           1          -1           1          -1          1
 SYMBOL      =         'X'         'X'         'X'         'X'        'X'        'X'        'X'          'X'         'X'
'X'         'X'         'X'          'X'          'X'         'X'          'X'
 ICLOSED     =           1           1           1           1          1          1          1            1           1
1           1           1           1           1           1          1
 IKEY        =           1           1           1           1          1          1          1            1           1
1           1           1           1           1           1          1
 ILOG        =           0           0           0           0          0          0          0            0           0
0           0           0           0           0           0          0
 Y_AXIS_SIZE =        0.84        0.84        0.84        0.84       0.84       0.84       0.84         0.84        0.84
0.84        0.84        0.84          0.84          0.84        0.84          0.84
 Y_GAP       =        0.25        0.25        0.25        0.25       0.25       0.25       0.25         0.25        0.25
0.25        0.25        0.25          0.25          0.25        0.25          0.25
 /
 &ALIAS
 nkeepers=16
 nalias=5
 keepers(1,1)=  'SOL   ' 'STP   ' 'TMP   ' 'DTP   ' 'SWS   ' 'VWS   ' 'VWD   ' 'RNF   ' 'SIG   ' 'WET   ' 'RH    ' 'REF   ' 'CAL
' 'PWR   ' 'O3    ' 'FLW   '
 keepers(1,2)=  'XXXXXX' 'XXXXXX' 'XXXXXX' 'DEL   ' 'WS    ' 'WS    ' 'XXXXXX' 'XXXXXX' 'SD1   ' 'XXXXXX' 'XXXXXX' 'XXXXXX'
'XXXXXX' 'XXXXXX' 'XXXXXX' 'XXXXXX'
 keepers(1,3)=  'SOLRAD' 'XXXXXX' 'TEMP  ' 'DELTMP' 'XXXXXX' 'WSP   ' 'WDR   ' 'PRECPT' 'SIG   ' 'WET   ' 'RELHUM' 'XXXXXX'
'XXXXXX' 'XXXXXX' 'OZONE ' 'FLOWXX'
 keepers(1,4)=  'SR    ' 'XXXXXX' 'XXXXXX' 'DLTMP ' 'WS    ' 'WS    ' 'XXXXXX' 'PRECIP' 'SD1   ' 'WETNES' 'REL   ' 'XXXXXX'
'XXXXXX' 'XXXXXX' 'XXXXXX' 'XXXXXX'
 keepers(1,5)=  'XXXXXX' 'XXXXXX' 'XXXXXX' 'DTP   ' 'SCAWS ' 'XXXXXX' 'XXXXXX' 'RAIN  ' 'SIGMA ' 'XXXXXX' 'RH    ' 'XXXXXX'
'XXXXXX' 'XXXXXX' 'XXXXXX' 'XXXXXX'
 /
```

Figure 4-10. Example Run-time StackPlot Control File.

4.4.1 Calling a Site Manually Using Telephone Modem Software

Each site has a specific type of datalogger. The datalogger at a site may change and be updated over time. Data analysts are fully trained on the operation of each model of dataloggers used at sites in the NPS network.. The specific instructions for downloading data from each model is outlined and kept in the front of each of the Daily Calling Notebooks. The general steps include:

- Call the site modem with PC data communications software.
- Enter the datalogger security password once connected.
- Set the PC data communications software to capture incoming data to a file (see below for naming conventions).
- Enter the datalogger command(s) to show the logger date and time.
- Verify the datalogger date and time.
- Enter the datalogger command(s) used to collect the desired day(s) of data from the datalogger.
- Enter the datalogger command(s) to download the daily calibration data if it must be collected separately from the ambient and meteorological data.
- Enter the datalogger command(s) to download a list of most recent power failures at the site.
- Enter the datalogger command(s) to download the list of most recent messages left by the operator on the datalogger (optional).
- Enter the datalogger command(s) to properly disconnect from the datalogger so that it is available to continue collecting data.
- Disconnect from the site modem.

4.4.2 ASCII File Naming Convention for Manual Data Collection

A unique name is assigned to each data file from each site downloaded on any given day. The file name is assigned in the capture option of the communications software. The naming convention for the files is ssssmmdd.iii where ssss is the four-letter site abbreviation, mm is the month, dd is the day, and iii are the initials of analyst making the call and creating the file.

Manually collected data files are placed in the \\ars_net3\vol2\project\npsair\sitecall\3 folder until reprocessing is complete. If more than one day is downloaded from the datalogger, the file is manually edited after the call has been disconnected and the data separated into each daily file. These steps ensure that the name and format of manually downloaded data files exactly match automatically downloaded data files.

4.4.3 Manual Data Reprocessing

Data files edited to correct problems in the automatic *SITECALL* collection process or collected manually are reprocessed. To reprocess edited or manually collected data files:

- Go to an MS-DOS prompt.
- Enter **REPROCES *filespec folder step [options]*** where:

filespec = the file(s) to be reprocessed. For example, enter BIBE0225.97 to reprocess the file for Big Bend from February 25, 1997 or ???0225.97 to reprocess all files found from February 25, 1997.

folder = the folder where files to be reprocessed reside (1 or 3).

step = the reprocessing steps to run:

C = to clean and reformat SUMX datalogger files (default).
O = to clean and reformat Odessa datalogger files.
R = to reformat only.

[options] = optional processes:

START DATE *mm/dd/yy* (the default date is 8 days prior to the run date) and **END DATE *mm/dd/yy*** (the default date is 1 day prior to the run date) to create/recreate review plots file.

REVIEW_ONLY to work on review files only (no D or L files created).

NO_MES to not save diagnostic information to the .MES file

MAINT to create maintenance group review files in \\ars_net3\vol2\project\npsair\autopull. **Note:** do not include start/stop dates with this option.

Error messages are printed and diagnostic information is written to:

AQREPRO.ERR – *RETRY* error messages
AQREPRO.MES – *RETRY* diagnostic messages
AQREPRO.RET – list of sites that failed the *RETRY*

Occasionally, raw data files will repeatedly not reprocess correctly and may need to be manually corrected. For example, header information may need to be lined up or the file header rearranged so that it is in the proper format for correct reprocessing. The actual data values in the file are never altered.

4.5 DAILY REVIEW OF DATA FOLDER CONTENTS

Daily review of file sizes and locations is useful for error control and later archiving of data files. The data technician checks the following after each daily data collection:

- The calibration files (ssssmmdd.yyL) are the correct sizes. These files should be 279, 402, or 562 bytes in size.

- The number of raw files (ssssmmdd.yyR*)* is the same as the number of database ready files (ssssmmdd.yyD) in the \\ars_net3\vol2\project\npsair\sitecall\1 folder.

- The date and time stamps of each reprocessed data file correctly reflect when the site was reprocessed. Reprocessed files are then copied to the \\ars_net3\vol2\project\npsair\sitecall\1 folder. Older files existing in this folder are overwritten.

Reprocessing and/or manually polling steps are taken if errors are found during these checks.

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1.0 PURPOSE AND APPLICABILITY

This technical instruction (TI) describes the steps taken by the National Park Service (NPS) Air Resources Division's (ARD) Information Management Center (IMC) for collecting ambient air quality and meteorological data from remote monitoring sites where no telephone lines are directly available. At these sites, data stored daily onto the portable data storage module (Ram Pack) are either mailed to the IMC or taken to a nearby location where a Ram Pack Reader, telephone, and modem are available. The data are downloaded at one-week intervals.

The primary purpose of daily collection via storage module is to assure quality data capture and minimize data loss by:

- Retrieving the data at regular intervals via telephone modem and downloading the data into site-specific daily files.
- Reformatting the raw datalogger files for loading into the Air Quality Database Management System (AQDBMS) Oracle Database.
- Reviewing the daily error and diagnostic printouts to verify complete data collection and to identify problems.

As referenced from Standard Operating Procedure (SOP) 3350, *Collection of Ambient Air Quality and Meteorological Monitoring Data*, this TI is a guide for assuring complete, error-free data collection from storage modules via telephone modems.

This TI assumes the operator has basic knowledge of IBM-PC compatible personal computers, the MS-DOS operating system, and Microsoft Windows95.

2.0 RESPONSIBILITIES

2.1 DATA COORDINATOR

The data coordinator shall ensure that a storage module is sent by the site operator from the site when necessary.

2.2 DATA TECHNICIAN

The data technician shall:

- Poll storage modules as needed.
- Review the polled data for errors.
- Reformat the data manually.

2.3 FIELD SPECIALIST

The field specialist shall:

- Provide assistance to the IMC for troubleshooting data collection problems.
- Assist the site operator in troubleshooting on-site instrument problems.

2.4 SITE OPERATOR

The site operator shall:

- Telephone the IMC or field specialist if data collection problems occur.
- Provide on-site assistance for troubleshooting data collection problems.
- Take the storage module to a location where a modem is available or mail it to the IMC.

3.0 REQUIRED EQUIPMENT AND MATERIALS

The IMC requires the following hardware and software to collect data from storage modules via telephone modems:

- IBM-PC compatible Pentium computer system with SVGA and 600MB hard disk
- Hayes compatible modem configured for COM2
- MS-DOS
- Novell networking client software NETX.EXE
- Crosstalk Mk.4 software for telephone modem collection
- PS-Print batch processing software
- SUMX and Odessa datalogger storage module interface
- Site configuration information maintained in the Air Quality Database Management System (AQDBMS).

Ambient air quality and meteorological monitoring stations generally require and are configured with the following equipment:

- SUMX, Odessa, or ESC datalogger
- Telephone modem
- Portable storage module at sites where telephone liens are not directly available.

4.0 METHODS

This section includes four (4) major subsections:

4.1 Data Acquisition
4.2 Daily Review of Folder Contents
4.3 Data Error Checking
4.4 Daily ASCII File Review

4.1 DATA ACQUISITION

The site operator replaces the Ram Pack storage module with an alternate module and takes the storage module to a Ram Pack Reader where a telephone and modem are available, inserts the module, and notifies the IMC. Alternatively, the site operator mails the storage module to the IMC where it is inserted into a reader at the IMC.

IMC personnel then collect data by completing the following steps:

- Establish communication with the Ram Pack Reader.
- Issue the specific datalogger retrieval commands.
- Name and store the data file.
- Submit the data file to the routine data processing programs.

These procedures are detailed in the following sections.

4.1.1 Calling a Ram Pack Reader Manually Using Telephone Modem Software

Each site has a specific type of datalogger. The datalogger at a site may change and be updated over time. Data analysts are fully trained on the operation of each model of dataloggers used at sites in the NPS network. The specific instructions for downloading data from each model is outlined and kept in the front of each of the Daily Calling notebooks. The general steps include:

- Call the Ram Pack Reader modem with PC data communications software.
- Set the PC data communications software to capture incoming data to a file (see below for naming conventions).
- Enter the Ram Pack Reader command(s) used to collect the desired day(s) of data from the reader.
- Disconnect from the modem.

4.1.2 ASCII File Naming Convention for Manual Data Collection

A unique name is assigned to each data file from each site downloaded on any given day. The file name is assigned in the capture option of the communications software. The naming convention for the files is ssssmmdd.iii where ssss is the four-letter site abbreviation, mm is the month, dd is the day, and iii are the initials of analyst making the call and creating the file.

Manually collected data files are placed in the \\ars_net3\vol2\project\npsair\sitecall\3 folder until reprocessing is complete. If more than one day is downloaded from the datalogger, the file is manually edited after the call has been disconnected and the data separated into each daily file. These steps ensure that the name and format of manually downloaded data files exactly match automatically downloaded data files.

4.1.3 Manual Data Reprocessing

Data files edited to correct problems in the automatic *SITECALL* collection process or collected manually are reprocessed. To reprocess edited or manually collected data files:

- Go to an MS-DOS prompt.
- Enter **REPROCES** ***filespec folder step [options]*** where:

filespec = the file(s) to be reprocessed. For example, enter BIBE0225.97 to reprocess the file for Big Bend from February 25, 1997 or ???0225.97 to reprocess all files found from February 25, 1997.

folder = the folder where files to be reprocessed reside (1 or 2).

step = the reprocessing steps to run:

C = to clean and reformat SUMX datalogger files (default).
O = to clean and reformat Odessa datalogger files.
R = to reformat only.

[options] = optional processes:

START DATE ***mm/dd/yy*** (the default date is 8 days prior to the run date) and **END DATE** ***mm/dd/yy*** (the default date is 1 day prior to the run date) to create/recreate review plots file.

REVIEW_ONLY to work on review files only (no D or L files created).

NO_MES to not save diagnostic information to the .MES file

MAINT to create maintenance group review files in \\ars_net3\vol2\project\npsair\autopull. **Note:** do not include start/stop dates with this option.

Error messages are printed and diagnostic information is written to:

AQREPRO.ERR – *RETRY* error messages
AQREPRO.MES – *RETRY* diagnostic messages
AQREPRO.RET – list of sites that failed the *RETRY*

Occasionally, raw data files will repeatedly not reprocess correctly and may need to be manually corrected. For example, header information may need to be lined up or the file header rearranged so that it is in the proper format for correct reprocessing. The actual data values in the file are never altered.

4.2 DAILY REVIEW OF DATA FOLDER CONTENTS

Daily review of file sizes and locations is useful for error control and later archiving of data files. The data technician checks the following after each daily data collection:

- The calibration files (ssssmmdd.yyL) are the correct sizes. These files should be 279, 402, or 562 bytes in size.

- The number of raw files (ssssmmdd.yyR*)* is the same as the number of database ready files (ssssmmdd.yyD) in the \\ars_net3\vol2\project\npsair\sitecall\3 folder.

- The date and time stamps of each reprocessed data file correctly reflect when the site was reprocessed. Reprocessed files are then copied to the \\ars_net3\vol2\project\npsair\sitecall\3 folder. Older files existing in this folder are overwritten.

Reprocessing and/or manually polling steps are taken if errors are found during these checks.

4.3 DATA ERROR CHECKING

Since the presence of error-checking modems is inconsistent throughout the NPS network, additional error checking must be performed in the *SITECALL* program. The first level of error checking occurs in the reformatting batch routine. The routine first checks for unacceptable ASCII characters and characters that are out of alignment. The routine checks for two levels of errors. One error level is non-fatal and it may be possible to reprocess these data with caution after editing the file. Fatal errors prevent the data from reprocessing successfully and a message is printed to the error file. If a fatal error occurs, the site must be recalled and the data collected until it is error-free.

Occasionally, data errors prove difficult to troubleshoot. A detailed description of the error is listed in the *SITECALL* error report (AQmmddyy.ERR) that is generated by each batch

job. A data analyst or applications programmer may need to examine this file in a text editor for additional diagnostic information to find the problem.

4.4 DAILY ASCII FILE REVIEW

Data from the daily data files are automatically reformatted and written to the following files:

ssssmmdd.yyO
ssssmmdd.yyR
ssssmmdd.yyC
ssssmmdd.yy.D
ssssmmdd.yy.L

Where:	ssss	= the four-letter site abbreviation
	mmdd	= the calendar month and day
	yy	= the year
	O	= the Odessa datalogger format data file
	R	= the SUMX datalogger format data file (may also be a converted Odessa data file)
	C	= cleaned file (ASCII clean up)
	D	= data reformatted in tabular format ready for loading into the database. Some data screening has been performed in this reformat process
	L	= daily calibration data written to tabular format including daily zero and span values and weekly precision data for loading into the database.

Examples of each type of file are shown in Figures 4-1 through Figure 4-5.

Raw and reformatted data files are written to \\ars_net3\vol2\project\npsair\sitecall\3. The *SITECALL* program also creates a *StackPlot* data file for each site stored in \\ars_net3\vol2\project\npsair\sitecall\review. The *StackPlot* data files are used to create weekly *Stackplots* as a tool in the data review and validation process (See TI 3450-5000, *Ambient Air Quality and Meteorological Data - Level 0 Data Validation*). The file naming convention is ssss.DAT where ssss is the four-letter site abbreviation.

If the *SITECALL* program works correctly, a new run-time *StackPlot* control file is created in the \\ars_net3\vol2\project\npsair\sitecall\review folder (Figure 4-6) that will plot the previous seven days of data. If a site does not process correctly, the data technician investigates the cause by examining the error and message files.

```
Polling time for GLAC  - 03:33:55a 03-03-98
?
T
TIME IS  03:33:58    0062  GNP 168     03/02/98
1
03:3C
                        CALIBRATION RESULTS
                          NONE  CONDUCTED
1
03:34:10  0061  01  GNP 168     03/02/98
============================================================*****
          01     02     03     04     05     06     07     08
CHAN    RAIN    WDR    WSP   TEMP DELTMP RELHUM  OZONE O3 CAL   SD1
UNITS INCHES    DEG    M/S  DEG C  DEG C      %    PPB    PPB   DEG
FSCL   10.00    360   50.0   50.0   7.00  100.0    496   1000  99.9
ZERO    0.00      0    0.0  -50.0  -3.00    0.0    -04      0  00.0
============================================================*****
01:00   0.00    137    0.3    0.3   0.25   82.4     15     00  62.1
02:00   0.00     60    0.4   -0.9   0.21   85.6     13     00  57.6
03:00   0.00     68    0.4   -2.0   0.35   88.9     10     00  65.6
04:00   0.00    122    0.2   -2.3   0.31   90.7     06     00  46.8
05:00   0.00     83    0.3   -2.6   0.28   91.6     04     00  59.5
06:00   0.00     76    0.3   -3.5   0.38   92.4     06     00  47.3
07:00   0.00     58    0.3   -4.4   0.32   93.4     04     00  54.0
08:00   0.00    140    0.2   -4.6   0.47   94.0     01     00  70.9
09:00   0.00    239    0.2   -3.6   0.47   93.9     06     00  50.3
10:00   0.00    228    0.5   -1.7   0.50   89.9     15     00  35.0
11:00   0.00     50    1.3    2.0   0.36   74.4     26     00  55.0
12:00   0.00     34    1.1    4.0   0.25   64.8     30     00  47.5
13:00   0.00     27    1.2    5.9   0.40   58.3     32     00  53.0
14:00   0.00     34    1.3    7.9   0.50   50.6     33     00  52.4
15:00   0.00     21    0.9    9.1   0.56   45.1     33     00  62.6
16:00   0.00     36    1.3    9.2   0.77   45.1     33     00  39.7
17:00   0.00    298    0.3    8.5   1.22   48.2     32     00  49.7
18:00   0.00    205    0.7    7.6   2.25   54.9     29     00  44.9
19:00   0.01    257    4.5    6.6   0.76   72.6     34     00  14.7
20:00   0.06    243    1.2    3.9   0.47   88.5     27     00  61.8
21:00   0.06    171    0.3    2.8   0.71   94.9     16     00  56.8
22:00   0.03    212    0.6    2.3   0.38   96.4     16<    00< 38.1
23:00   0.04    359    0.1    1.7   0.64   96.8     12C   -01C 69.8
24:00   0.02    181    0.2    1.6   0.45   97.3     09     00  34.8

SUMMA   0.22 ------    0.7    2.0   0.55   78.8     19<    00<

=========================================
          09     10     11     12     13
CHAN  SOLRAD   FLOW  SCAWS WETNES    STP
UNITS   W/M2    LPM    M/S ON/OFF    DGC
FSCL    1396   4.88   50.0    100  100.0
ZERO       0    .00    0.0      0     .0
=========================================
01:00     00   3.00    0.6     01   24.2
02:00     00   3.00    0.6     01   24.2
03:00     00   3.00    0.6     01   24.3
04:00     00   3.00    0.4     01   24.3
05:00     00   3.00    0.5     01   24.3
06:00     00   3.00    0.4     01   24.3
07:00     00   3.00    0.5     01   24.4
08:00     09   3.00    0.4     01   24.4
09:00    106   3.00    0.5     01   24.4
10:00    171   3.00    0.6     01   24.3
11:00    320   3.00    1.6     01   24.2
12:00    273   3.00    1.5     01   24.3
13:00    492   3.00    1.7     01   24.4
14:00    564   3.00    1.7     01   24.4
15:00    392   3.00    1.3     01   25.0
16:00    222   3.00    1.5     01   24.8
17:00     92   3.00    0.8     01   24.0
18:00     14   3.00    1.0     01   24.3
19:00     00   3.00    4.5     01   24.2
20:00     00   3.00    1.6     01   24.3
21:00     00   3.00    0.7     01   24.2
22:00     00   3.00    0.6     01   24.3
23:00    -04   3.00    0.3     01   24.0
24:00     00   3.00    0.3     01   24.2

SUMMA    111   3.00    1.0     01   24.3

                        CALIBRATION RESULTS
ZERO/SPAN  PARAMETER   START   STOP   DAY   ACTUAL  EXPECTED   TYPE
  ZERO      07  OZONE   22:30  22:45  0061      -04      -04     I
  SPAN2     07  OZONE   22:00  22:30  0061      401      396     I
  ZERO      08 O3 CAL   22:30  22:45  0061      -03       00     I
  SPAN2     08 O3 CAL   22:00  22:30  0061      404      400     I
```

Figure 4-1. Example Odessa Datalogger Format Data File.

```
Polling time for DENA  - 04:18:32a 03-03-98
>:T
TIME  02:17:57  03/03/98    62
:::
CHARACTERS :    46
  CHECKSUM :  1798
>
?
>:1

PREVIOUS DAILY SUMMARY               03/02/98    61     DENALI NP
*******************************************************************************
COLUMN NUMBER        01      02      03      04      05      06      07      08
CHANNEL NUMBER       06      07      02      04      04      02      03      08
CHANNEL NAME         O3     CAL     VWD     VWS     SWS     SIG     TMP     DTP
CHANNEL UNITS       PPB     PPB     DEG     M/S     M/S     DEG     DGC     DGC
FULL SCALE VALUE    483     980     540    50.0    50.0     540    50.0    -5.0
ZERO VALUE          -17     -20       0      .0      .0       0   -30.0     5.0
INPUT RANGE           1       1       5       5       5       5       5       5
INPUT TYPE            S       S       S       S       S       S       S       S
-------------------------------------------------------------------------------
01:00                46      -1      12     1.0     1.0      19   -16.4     1.1
02:00                46      -1     344      .7      .7      29   -16.7     1.1
03:00                45      -1     259      .5      .7      34   -17.0      .9
04:00                43      -1      27      .1      .7      86   -17.9      .7
05:00                40      -1     256      .6      .8      40   -18.4      .8
06:00                34      -1     257      .6      .8      49   -18.3      .8
07:00                38      -1     250      .6      .7      35   -18.6     1.3
08:00                36      -1     294      .6      .8      44   -18.3     1.5
09:00                36      -1     315      .6      .9      56   -18.0     1.5
10:00                37      -1     159      .4      .7      56   -16.6     1.1
11:00                36      -1     155      .5      .8      44   -16.5      .3
12:00                37      -1     184      .6      .8      38   -15.0      .3
13:00                40      -1     130      .8     1.0      38   -11.3      .5
14:00                44      -1     136      .8     1.2      49    -9.7      .1
15:00                45      -1     169     1.0     1.2      49    -8.6      .1
16:00                45      -1     172     1.0     1.2      37    -8.2      .3
17:00                45      -1     221     1.3     1.4      22    -9.1      .2
18:00                44      -1     237      .6      .9      61   -10.5      .5
19:00                45      -1     324      .6      .7      34   -12.0     1.3
20:00                45      -1     298      .7      .8      31   -13.2     1.5
21:00                45      -1     339      .6      .6       8   -14.3     1.2
22:00                44      -1     354      .7      .7      14   -15.0     1.1
23:00              227C    222C     335      .6      .6       8   -15.9     1.4
00:00                43      -1     345      .8      .8      10   -16.5     1.5

AVERAGE              42<     -1<     262      .2      .9          -14.7      .9

*******************************************************************************
COLUMN NUMBER        09      10      11      12      13      14      15      16
CHANNEL NUMBER       05      99      13      11      15      17      09      19
CHANNEL NAME        SOL     RNF     STP     FLW      RH     WET     PWR     REF
CHANNEL UNITS       WMS      MM     DGC     LPM       %      +/-     VAC     MVT
FULL SCALE VALUE   1396   200.0   100.0    5.49     100     100     500    1000
ZERO VALUE            0      .0      .0     .00       0       0       0       0
INPUT RANGE           5               1       5       5       1       5       1
INPUT TYPE            S               D       D       D       D       D       D
-------------------------------------------------------------------------------
01:00                 0      .0    22.5     .00      74     102     117    1024
02:00                 1      .0    22.6     .00      75     102     117    1024
03:00                 1      .0    22.5     .00      76     102     117    1024
04:00                 1      .0    22.6     .00      77     102     117    1024
05:00                 1      .0    22.6     .00      79     102     117    1024
06:00                 0      .0    22.6     .00      81     102     117    1024
07:00                 1      .0    22.4     .00      83     102     116    1024
08:00                 1      .0    22.4     .00      85     102     116    1024
09:00                24      .0    22.4     .00      86     102     115    1024
10:00               137      .0    22.5     .00      85     102     116    1024
11:00               130      .0    22.4     .00      82     102     116    1024
12:00               152      .0    22.5     .00      80     102     116    1024
13:00               347      .0    22.7     .00      77     102     116    1024
14:00               299      .0    23.0     .00      74     102     116    1024
```

Figure 4-2. Example SUMX Datalogger Format Data File (May Also be a Converted Odessa Data File).

```
15:00              220      .0    23.3     .00      74     102     117    1024
16:00              173      .0    23.4     .00      73     102     117    1024
17:00               82      .0    23.2     .00      72     102     116    1024
18:00               29      .0    23.1     .00      73     102     116    1024
19:00                3      .0    22.9     .00      75     102     116    1024
20:00                1      .0    22.7     .00      78     102     116    1024
21:00                1      .0    22.7     .00      80     102     116    1024
22:00                1      .0    22.7     .00      82     102     116    1024
23:00                1      .0    22.7     .00      84     102     117    1024
00:00                1      .0    22.6     .00      87     102     117    1024

AVERAGE             67      .0    22.7     .00      79     102     116    1024


CALIBRATION-RESULTS


COLUMNS # & NAME    LEVEL 0   LEVEL 1   LEVEL 2   LEVEL 3   LEVEL 4   LEVEL 5


01  O3   ACTUAL          3C      -17                                     405C
         THEORETICAL     0        90                                     400

02 CAL   ACTUAL          3C      -20                                     410C
         THEORETICAL     0        90                                     400
:::

CHARACTERS :  6579
  CHECKSUM :  6976

>:F
POWER FAILURES              02:19:19  03/03/98    62     DENALI NP

       FROM                            TO
01   15:54:13  01/08/98    8       15:54:19  01/08/98    8
02   15:42:24  01/08/98    8       15:42:30  01/08/98    8
03   11:41:58  12/27/97  361       11:42:03  12/27/97  361
04   02:40:48  12/19/97  353       02:40:56  12/19/97  353
05   14:09:06  12/18/97  352       14:38:12  12/18/97  352
06   09:38:34  12/11/97  345       11:30:36  12/11/97  345
07   10:35:12  12/09/97  343       10:35:42  12/09/97  343
08   10:34:17  12/09/97  343       10:34:39  12/09/97  343
09   11:03:09  12/06/97  340       13:51:14  12/06/97  340
10   13:43:53  12/05/97  339       13:51:51  12/05/97  339
:::

CHARACTERS :   791
  CHECKSUM :  2518

>
?
>L
LAST MESSAGE     16:20:32  02/11/98    42
(cont) contact Midori Raymore at (907) 683-9541.  Thanks, AJB
LAST MESSAGE     16:17:47  02/11/98    42
Station check 1545-1617. If problems @ Denali site now to 2/28, please
LAST MESSAGE     09:19:03  02/05/98    36
Multipoint calibration 2/4/98, 1610-1720. AJB
LAST MESSAGE     16:41:34  02/03/98    34
Station check 1528-1641. AJB
>!
PASSWORD :
```

Figure 4-2 (Continued) Example SUMX Datalogger Format Data File (May Also be a Converted Odessa Data File).

```
Polling time for DENA  - 04:18:32a 03-03-98
>:T
TIME  02:17:57  03/03/98    62
:::
CHARACTERS :    46
  CHECKSUM :  1798
>
?
>:1
PREVIOUS DAILY SUMMARY               03/02/98    61     DENALI NP
********************************************************************************
COLUMN NUMBER        01      02      03      04      05      06      07      08
CHANNEL NUMBER       06      07      02      04      04      02      03      08
CHANNEL NAME         O3     CAL     VWD     VWS     SWS     SIG     TMP     DTP
CHANNEL UNITS       PPB     PPB     DEG     M/S     M/S     DEG     DGC     DGC
FULL SCALE VALUE    483     980     540    50.0    50.0     540    50.0    -5.0
ZERO VALUE          -17     -20       0      .0      .0       0   -30.0     5.0
INPUT RANGE           1       1       5       5       5       5       5       5
INPUT TYPE            S       S       S       S       S       S       S       S
--------------------------------------------------------------------------------
01:00                46      -1      12     1.0     1.0      19   -16.4     1.1
02:00                46      -1     344      .7      .7      29   -16.7     1.1
03:00                45      -1     259      .5      .7      34   -17.0      .9
04:00                43      -1      27      .1      .7      86   -17.9      .7
05:00                40      -1     256      .6      .8      40   -18.4      .8
06:00                34      -1     257      .6      .8      49   -18.3      .8
07:00                38      -1     250      .6      .7      35   -18.6     1.3
08:00                36      -1     294      .6      .8      44   -18.3     1.5
09:00                36      -1     315      .6      .9      56   -18.0     1.5
10:00                37      -1     159      .4      .7      56   -16.6     1.1
11:00                36      -1     155      .5      .8      44   -16.5      .3
12:00                37      -1     184      .6      .8      38   -15.0      .3
13:00                40      -1     130      .8     1.0      38   -11.3      .5
14:00                44      -1     136      .8     1.2      49    -9.7      .1
15:00                45      -1     169     1.0     1.2      49    -8.6      .1
16:00                45      -1     172     1.0     1.2      37    -8.2      .3
17:00                45      -1     221     1.3     1.4      22    -9.1      .2
18:00                44      -1     237      .6      .9      61   -10.5      .5
19:00                45      -1     324      .6      .7      34   -12.0     1.3
20:00                45      -1     298      .7      .8      31   -13.2     1.5
21:00                45      -1     339      .6      .6       8   -14.3     1.2
22:00                44      -1     354      .7      .7      14   -15.0     1.1
23:00              227C    222C     335      .6      .6       8   -15.9     1.4
00:00                43      -1     345      .8      .8      10   -16.5     1.5
AVERAGE              42<     -1<    262      .2      .9          -14.7      .9
********************************************************************************
COLUMN NUMBER        09      10      11      12      13      14      15      16
CHANNEL NUMBER       05      99      13      11      15      17      09      19
CHANNEL NAME        SOL     RNF     STP     FLW      RH     WET     PWR     REF
CHANNEL UNITS       WMS      MM     DGC     LPM       %     +/-     VAC     MVT
FULL SCALE VALUE   1396   200.0   100.0    5.49     100     100     500    1000
ZERO VALUE            0      .0      .0     .00       0       0       0       0
INPUT RANGE           5               1       5       5       1       5       1
INPUT TYPE            S               D       D       D       D       D       D
--------------------------------------------------------------------------------
01:00                 0      .0    22.5     .00      74     102     117    1024
02:00                 1      .0    22.6     .00      75     102     117    1024
03:00                 1      .0    22.5     .00      76     102     117    1024
04:00                 1      .0    22.6     .00      77     102     117    1024
05:00                 1      .0    22.6     .00      79     102     117    1024
06:00                 0      .0    22.6     .00      81     102     117    1024
07:00                 1      .0    22.4     .00      83     102     116    1024
08:00                 1      .0    22.4     .00      85     102     116    1024
09:00                24      .0    22.4     .00      86     102     115    1024
10:00               137      .0    22.5     .00      85     102     116    1024
11:00               130      .0    22.4     .00      82     102     116    1024
12:00               152      .0    22.5     .00      80     102     116    1024
13:00               347      .0    22.7     .00      77     102     116    1024
14:00               299      .0    23.0     .00      74     102     116    1024
15:00               220      .0    23.3     .00      74     102     117    1024
16:00               173      .0    23.4     .00      73     102     117    1024
17:00                82      .0    23.2     .00      72     102     116    1024
18:00                29      .0    23.1     .00      73     102     116    1024
19:00                 3      .0    22.9     .00      75     102     116    1024
20:00                 1      .0    22.7     .00      78     102     116    1024
21:00                 1      .0    22.7     .00      80     102     116    1024
22:00                 1      .0    22.7     .00      82     102     116    1024
23:00                 1      .0    22.7     .00      84     102     117    1024
00:00                 1      .0    22.6     .00      87     102     117    1024
AVERAGE              67      .0    22.7     .00      79     102     116    1024
CALIBRATION-RESULTS
```

Figure 4-3. Example Cleaned File (ASCII Clean Up).

```
COLUMNS # & NAME    LEVEL 0   LEVEL 1   LEVEL 2   LEVEL 3   LEVEL 4   LEVEL 5
01  O3   ACTUAL          3C      -17                                     405C
         THEORETICAL     0        90                                     400
02 CAL   ACTUAL          3C      -20                                     410C
         THEORETICAL     0        90                                     400
:::
CHARACTERS :  6579
  CHECKSUM :  6976
>:F
POWER FAILURES              02:19:19  03/03/98    62     DENALI NP
       FROM                           TO
01   15:54:13  01/08/98    8       15:54:19  01/08/98    8
02   15:42:24  01/08/98    8       15:42:30  01/08/98    8
03   11:41:58  12/27/97  361       11:42:03  12/27/97  361
04   02:40:48  12/19/97  353       02:40:56  12/19/97  353
05   14:09:06  12/18/97  352       14:38:12  12/18/97  352
06   09:38:34  12/11/97  345       11:30:36  12/11/97  345
07   10:35:12  12/09/97  343       10:35:42  12/09/97  343
08   10:34:17  12/09/97  343       10:34:39  12/09/97  343
09   11:03:09  12/06/97  340       13:51:14  12/06/97  340
10   13:43:53  12/05/97  339       13:51:51  12/05/97  339
:::
CHARACTERS :   791
  CHECKSUM :  2518
>
?
>L
LAST MESSAGE     16:20:32  02/11/98    42
(cont) contact Midori Raymore at (907) 683-9541.  Thanks, AJB
LAST MESSAGE     16:17:47  02/11/98    42
Station check 1545-1617. If problems @ Denali site now to 2/28, please
LAST MESSAGE     09:19:03  02/05/98    36
Multipoint calibration 2/4/98, 1610-1720. AJB
LAST MESSAGE     16:41:34  02/03/98    34
Station check 1528-1641. AJB
>!
PASSWORD :
```

Figure 4-3 (Continued). Example Cleaned File (ASCII Clean Up).

```
DENA DATE    TIME   O3        CAL       VWD       VWS       SWS       SIG       TMP       DTP       SOL       RNF       STP
FLW       RH        WET       PWR       REF
DENA DATE    TIME   PPB       PPB       DEG       M/S       M/S       DEG       DGC       DGC       WMS       MM        DGC
LPM       %         +/-       VAC       MVT
DENA DATE    TIME    483       980       540       50.0      50.0      540       50.0      -5.0      1396      200.0     100.0
5.49      100       100       500       1000
DENA DATE    TIME    -17       -20       0         .0        .0        0         -30.0     5.0       0         .0        .0
.00       0         0         0         0
DENA 980302     0   46.000    -1.000    12.000    1.000     1.000    19.000   -16.400    1.100      .000      .000    22.500
.000    74.000   102.000   117.000  1024.000
DENA 980302   100   46.000    -1.000   344.000     .700      .700    29.000   -16.700    1.100     1.000      .000    22.600
.000    75.000   102.000   117.000  1024.000
DENA 980302   200   45.000    -1.000   259.000     .500      .700    34.000   -17.000     .900     1.000      .000    22.500
.000    76.000   102.000   117.000  1024.000
DENA 980302   300   43.000    -1.000    27.000     .100      .700    86.000   -17.900     .700     1.000      .000    22.600
.000    77.000   102.000   117.000  1024.000
DENA 980302   400   40.000    -1.000   256.000     .600      .800    40.000   -18.400     .800     1.000      .000    22.600
.000    79.000   102.000   117.000  1024.000
DENA 980302   500   34.000    -1.000   257.000     .600      .800    49.000   -18.300     .800      .000      .000    22.600
.000    81.000   102.000   117.000  1024.000
DENA 980302   600   38.000    -1.000   250.000     .600      .700    35.000   -18.600    1.300     1.000      .000    22.400
.000    83.000   102.000   116.000  1024.000
DENA 980302   700   36.000    -1.000   294.000     .600      .800    44.000   -18.300    1.500     1.000      .000    22.400
.000    85.000   102.000   116.000  1024.000
DENA 980302   800   36.000    -1.000   315.000     .600      .900    56.000   -18.000    1.500    24.000      .000    22.400
.000    86.000   102.000   115.000  1024.000
DENA 980302   900   37.000    -1.000   159.000     .400      .700    56.000   -16.600    1.100   137.000      .000    22.500
.000    85.000   102.000   116.000  1024.000
DENA 980302  1000   36.000    -1.000   155.000     .500      .800    44.000   -16.500     .300   130.000      .000    22.400
.000    82.000   102.000   116.000  1024.000
DENA 980302  1100   37.000    -1.000   184.000     .600      .800    38.000   -15.000     .300   152.000      .000    22.500
.000    80.000   102.000   116.000  1024.000
DENA 980302  1200   40.000    -1.000   130.000     .800     1.000    38.000   -11.300     .500   347.000      .000    22.700
.000    77.000   102.000   116.000  1024.000
DENA 980302  1300   44.000    -1.000   136.000     .800     1.200    49.000    -9.700     .100   299.000      .000    23.000
.000    74.000   102.000   116.000  1024.000
DENA 980302  1400   45.000    -1.000   169.000    1.000     1.200    49.000    -8.600     .100   220.000      .000    23.300
.000    74.000   102.000   117.000  1024.000
DENA 980302  1500   45.000    -1.000   172.000    1.000     1.200    37.000    -8.200     .300   173.000      .000    23.400
.000    73.000   102.000   117.000  1024.000
DENA 980302  1600   45.000    -1.000   221.000    1.300     1.400    22.000    -9.100     .200    82.000      .000    23.200
.000    72.000   102.000   116.000  1024.000
DENA 980302  1700   44.000    -1.000   237.000     .600      .900    61.000   -10.500     .500    29.000      .000    23.100
.000    73.000   102.000   116.000  1024.000
DENA 980302  1800   45.000    -1.000   324.000     .600      .700    34.000   -12.000    1.300     3.000      .000    22.900
.000    75.000   102.000   116.000  1024.000
DENA 980302  1900   45.000    -1.000   298.000     .700      .800    31.000   -13.200    1.500     1.000      .000    22.700
.000    78.000   102.000   116.000  1024.000
DENA 980302  2000   45.000    -1.000   339.000     .600      .600     8.000   -14.300    1.200     1.000      .000    22.700
.000    80.000   102.000   116.000  1024.000
DENA 980302  2100   44.000    -1.000   354.000     .700      .700    14.000   -15.000    1.100     1.000      .000    22.700
.000    82.000   102.000   116.000  1024.000
DENA 980302  2200  227.000C  222.000C  335.000     .600      .600     8.000   -15.900    1.400     1.000      .000    22.700
.000    84.000   102.000   117.000  1024.000
DENA 980302  2300   43.000    -1.000   345.000     .800      .800    10.000   -16.500    1.500     1.000      .000    22.600
.000    87.000   102.000   117.000  1024.000
```

Figure 4-4. Example Data Reformatted in Tabular Format Ready for Loading into the Database.

```
DENA DATE    TIME  A_O3___L0 A_O3___L1 A_O3___L5 T_O3___L0 T_O3___L1
T_O3___L5 A_O3CALL0 A_O3CALL1 A_O3CALL5 T_O3___L0 T_O3___L1 T_O3___L5
DENA 980302  2300     .003C    -.017      .405C     .000      .090      .400
.003C    -.020      .410C     .000      .090      .400
```

Figure 4-5. Daily Calibration Data Written to Tabular Format Including Daily Zero and Span Values and Weekly Precision Data for Loading into the Database.

```
 DATA_DATE         = 'CALENDAR'
 DATA_FORMAT       = 'FREE'
 FILE_TAG          = T
 GMT_DIF           = 0
 INPUT_FILE        = 'DENA.DAT'
 MISSING           = -999.000000
 NUM_IN_FIELDS     = 16
 NUM_TO_GRAPH      = 16
 PERIOD            = 1.000000
 TIME_UNITS        = 'HOUR'
 /
 &PAGE_DEF
 FRAME_MARGIN      =     0.5

 MAIN_TITLE        = 'Denali National Park'
 N_PLOTS           =  1
 N_GRAPHS          = 8
 LAST_FIELD        = 16
 FIRST_FIELD       = 1

 BAR_WIDTH         = 0.000000E+00
 B_MARGIN          = 1.350000
 CHAR_CHH          = 6.000000E-02
 CLIP              = F
 COLOROP           = T
 DASH_OP           = T
 DATE_FORMAT       = 'MMDDYY'
 FOOTNOTE          =  'RAW DATA'
 FRAME             = F
 HOUR_INTERVAL     = 12
 HOUR_LABELS       = F
 LINE_WIDTH        = 1.000000
 L_MARGIN          = 1.2500000
 MAIN_CHH          = 1.000000E-01
 PLOT_DATE         = 'BOTH'
 PLOT_DOW          = T
 SYM_SIZE          = 2.000000E-02
 TIME_ZONE         = 'LST'
 TITLE_FONT        = 1
 TITLE_TOP         = T
 T_MARGIN          = 2.000000E-01
 WKID              = 1
 X_LABEL_INTERVAL  = 1
 X_PLOT_SIZE       = 6.000000
 X_TITLE_MARGIN    = .6
 YGRID             = T
 /
 &VAR_DEF
 INPUT_FIELD =          1          2          3          4          5          6          7          8          9
10         11         12         13         14        15          16
 FIELD_NAME  = 'SOL(w/m2)' 'STP(degC)' 'TMP(degC)' 'DTP(degC)' 'SWS(m/s)' 'VWS(m/s)' 'VWD(deg)'    'RNF(mm)' 'SDWD(deg)'
'WET(%on)'    'RH(%)' 'REF(mvt)' 'O3 CAL(ppb)' 'PWR(volts)' 'O3(ppb)' 'FLOW(L/min)'
 YMIN       =          0        15.0       -30.0        -5.0        0.0        0.0        0.0          0         0.0
0.0        0.0      650.0          0         70.0          0          0.5
 YMAX       =       1400        35.0        50.0         5.0       16.0       16.0      360.0         40       100.0
100.0      100.0     1050.0         200        150.0        100          4.5
 MAJOR_TIC  =        350         5.0        20.0         2.5        4.0        4.0       90.0         10        25.0
25.0       25.0      100.0          50        20.0          25          1.0
 LABEL_DEC  =          0          0          0          1          0          0          0          1          0
0          0          0          0          0          0          1
 LINE_COLOR =          2          4          2          4          2          4          2          4          2
4          2          4          2          4          2          4
 LINE_TYPE  =         -1          1         -1          1         -1          1         -2          0         -1
1         -1          1         -1          1         -1          1
 SYMBOL     =        'X'        'X'       'X'        'X'       'X'        'X'       'X'        'X'       'X'
'X'        'X'        'X'         'X'         'X'        'X'         'X'
 ICLOSED    =          1          1          1          1          1          1          1          1          1
1          1          1          1          1          1          1
 IKEY       =          1          1          1          1          1          1          1          1          1
1          1          1          1          1          1          1
 ILOG       =          0          0          0          0          0          0          0          0          0
0          0          0          0          0          0          0
 Y_AXIS_SIZE =       0.84       0.84       0.84       0.84       0.84       0.84       0.84       0.84       0.84
0.84       0.84       0.84       0.84       0.84       0.84       0.84
 Y_GAP      =       0.25       0.25       0.25       0.25       0.25       0.25       0.25       0.25       0.25
0.25       0.25       0.25         0.25       0.25       0.25         0.25
 /
 &ALIAS
 nkeepers=16
 nalias=5
 keepers(1,1)=  'SOL   ' 'STP   ' 'TMP   ' 'DTP   ' 'SWS   ' 'VWS   ' 'VWD   ' 'RNF   ' 'SIG   ' 'WET   ' 'RH    ' 'REF   ' 'CAL
' 'PWR   ' 'O3    ' 'FLW   '
 keepers(1,2)=  'XXXXXX' 'XXXXXX' 'XXXXXX' 'DEL   ' 'WS    ' 'WS    ' 'XXXXXX' 'XXXXXX' 'SD1   ' 'XXXXXX' 'XXXXXX' 'XXXXXX'
'XXXXXX' 'XXXXXX' 'XXXXXX' 'XXXXXX'
 keepers(1,3)=  'SOLRAD' 'XXXXXX' 'TEMP  ' 'DELTMP' 'XXXXXX' 'WSP   ' 'WDR   ' 'PRECPT' 'SIG   ' 'WET   ' 'RELHUM' 'XXXXXX'
'XXXXXX' 'XXXXXX' 'OZONE ' 'FLOWXX'
 keepers(1,4)=  'SR    ' 'XXXXXX' 'XXXXXX' 'DLTMP ' 'WS    ' 'WS    ' 'XXXXXX' 'PRECIP' 'SD1   ' 'WETNES' 'REL   ' 'XXXXXX'
'XXXXXX' 'XXXXXX' 'XXXXXX' 'XXXXXX'
 keepers(1,5)=  'XXXXXX' 'XXXXXX' 'XXXXXX' 'DTP   ' 'SCAWS ' 'XXXXXX' 'XXXXXX' 'RAIN  ' 'SIGMA ' 'XXXXXX' 'RH    ' 'XXXXXX'
'XXXXXX' 'XXXXXX' 'XXXXXX' 'XXXXXX'
 /
```

Figure 4-6. Example Run-time StackPlot Control File.

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QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	**AMBIENT AIR QUALITY AND METEOROLOGICAL DATA VALIDATION**
TYPE	**STANDARD OPERATING PROCEDURE**
NUMBER	**3450**
DATE	**MARCH 1998**

AUTHORIZATIONS		
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1.0 PURPOSE AND APPLICABILITY

This standard operating procedure (SOP) outlines the steps of ambient air quality and meteorological data validation to assure quality data and to endure that data are validated to a satisfactory level for successful submission to the EPA AIRS database. The steps outlined apply to all ambient air quality and meteorological parameters that are monitored and loaded into the IMC database, regardless of whether the data for a specific parameter are uploaded to the EPA AIRS database.

The validation process consists of the following major steps:

- Reviewing raw data visually on a daily basis for data acquisition errors and for details on instrument performance.
- Processing data through Level 0 validation to ensure that all possible data have been collected and are correctly loaded into the permanent table of the database.
- Processing data through preliminary validation to identify values that do not meet acceptance criteria.
- Processing data through final validation that includes input from air quality specialists, field specialists, and site operators to resolve all questionable validation issues.
- Accommodating post-final validation changes when necessary.

Successful validation at each level requires completion of a set of automatic (computer program) and manual checkpoints as shown in the data collection, validation, and reporting flow diagram (Figure 1-1).

2.0 RESPONSIBILITIES

2.1 DATA COORDINATOR

The data coordinator shall:

- Update information in the site configuration table of the AQDBMS as needed.
- Update Stackplot configuration files as needed.
- Review Stackplots.
- Review annotations made on Stackplots by the data technician and data analyst.
- Review validation codes entered into the AQDBMS by the data technician and data analyst.
- Verify hand-entered data values.
- Update the Data Validation Log in the AQDBMS with the preliminary validation date.

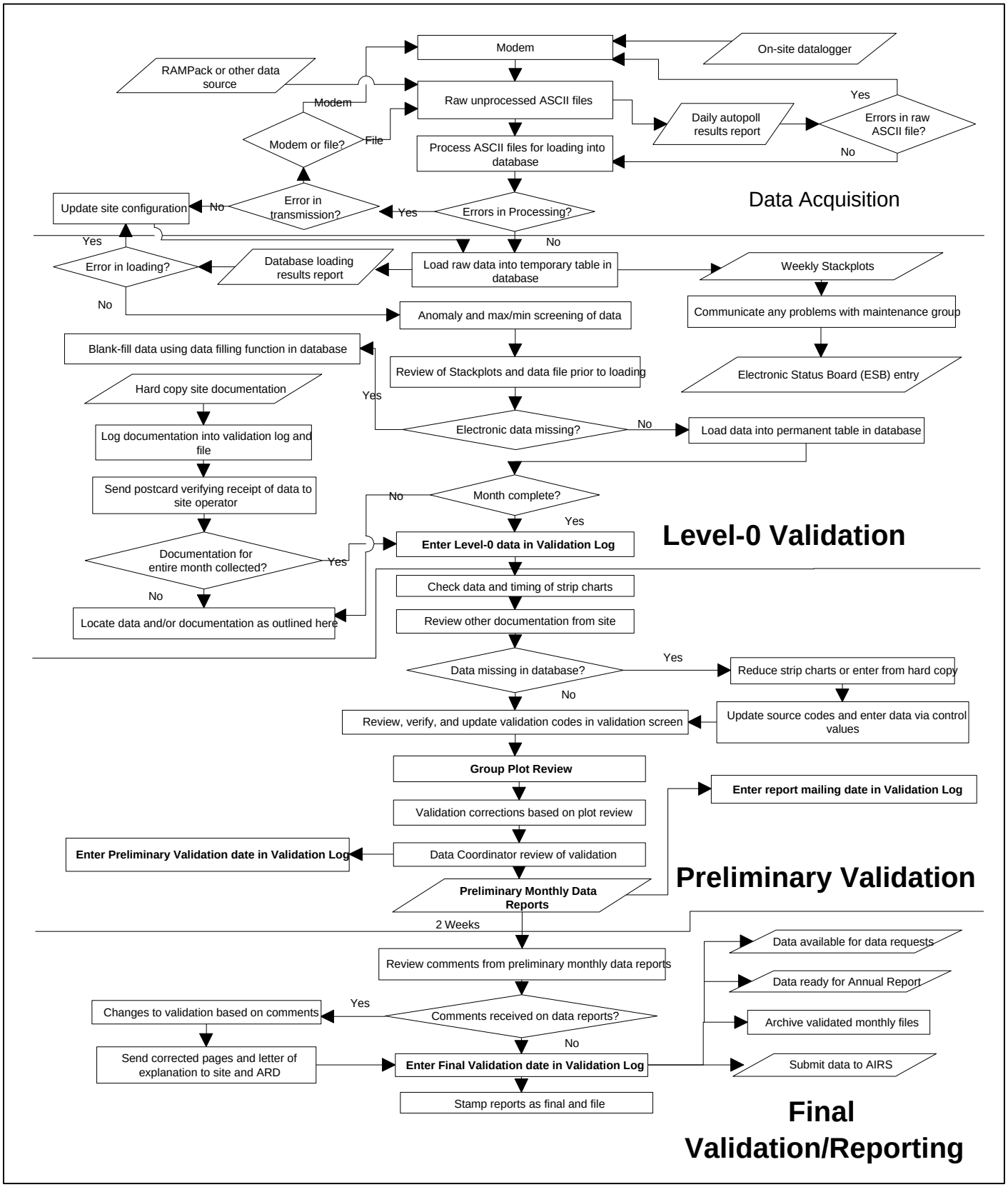

Figure 1-1. NPS Ambient Air Quality and Meteorological Monitoring Network Data Collection, Validation, and Reporting Flow Diagram.

2.2 DATA ANALYST

The data analyst shall:

- Review and annotate Stackplots.
- Update the Data Validation Log in the AQDBMS with the Stackplots commented date.
- Enter validation codes into the AQDBMS based on the Stackplot annotations.
- Review annotated Stackplots with the field specialist.
- Respond to questions posed during the plot review.

2.3 DATA TECHNICIAN

The data technician shall:

- Collect digital data.
- Load data into the database.
- Run the anomaly screening program on the data.
- Blank fill missing data as necessary.
- Print and review Stackplots.
- Collect and log field documentation.
- File all hard copies.
- Update the Data Validation Log in the AQDBMS.
- Annotate Stackplots using field documentation.
- Update the Data Validation Log in the AQDBMS with the Stackplots commented date.
- Enter validation codes into the AQDBMS based on the Stackplot annotations.
- Review annotated Stackplots with the field specialist.
- Post annotated Stackplots on the bulletin board.
- Respond to questions posed during the plot review.

2.4 FIELD SPECIALIST

The field specialist shall:

- Review Stackplots.
- Review annotated Stackplots with the data analyst and data technician before the plot review.
- Respond to questions posed during the plot review.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 THE AIR QUALITY DATABASE MANAGEMENT SYSTEM (AQDBMS)

The Air Quality Database Management System (AQDBMS) is the primary tool used to validate ambient air quality and meteorological data. The Air Quality Database Management System (AQDBMS) is comprised of two main components:

- An Oracle database specifically designed and developed by Air Resource Specialists (ARS) to hold air quality network data and to accommodate the many temporal, spatial, and functional variations found within an air quality network.
- Customized software programs developed by Air Resource Specialists that provide an interface to the Oracle database.

3.1.1 System Hardware Requirements

The AQDBMS requires the following hardware:

- Workstations - Networked Intel Pentium-based workstations with at least 16MB of RAM (32MB recommended), 1024 x 768 resolution (recommended large fonts, 17 inch or larger monitor), 40MB of available hard disk space, and a mouse.
- Database Server - An Intel Pentium-based database server with hard disks providing at least 2 gigabytes of storage and at least 48MB of RAM, color monitor, mouse, CD-ROM, and back-up device.
- Reporting - High-resolution laserjet or inkjet printer for printing.

3.1.2 System Software Requirements

The AQDBMS requires the following commercial software:

- PC operating system - Microsoft Windows95.
- Network operating system - Novell Netware 3.12 or 4.11; IPX protocol.

- Database engine - The Oracle 7 (version 7.2 or 7.3) Workgroup Server for Netware Relational Database Management System (RDBMS).

- Database connectivity - Oracle SQL*Net (version 2.2 or 2.3) IPX protocol adapter. Oracle ODBC Driver for Oracle version 2.05 or later.

- User interface - Powersoft PowerBuilder version 5.0.02 run-time libraries. Microsoft VisualBasic version 5.0 run-time libraries.

The AQDBMS requires the following ARS-developed software:

- User interface for loading, screening, validation, reporting, creation of AIRS files, etc. – PowerBuilder executables (ESD.exe and .PBD files). VisualBasic executables (vbrose32.exe, diur32.exe, vbbar32.exe, stkwin.exe vbsum32.exe).

4.0 METHODS

This section discusses the levels of data validation and the methods used to complete each level of air quality and meteorological data validation. Throughout the data validation process, the programs within the AQDBMS are used extensively. Details on operating the system are found in the following technical instructions:

- TI 3450-5000, *Ambient Air Quality and Meteorological Data – Level 0 Validation*

- TI 3450-5010, *Ambient Air Quality and Meteorological Data – Preliminary Validation*

- TI 3450-5020, *Ambient Air Quality and Meteorological Data – Final Validation*

This section includes four (4) main subsections:

4.1 Level 0 Validation Procedures
4.2 Preliminary Validation Procedures
4.3 Final Validation Procedures
4.4 Post-Final Validation Procedures

4.1 LEVEL 0 VALIDATION PROCEDURES

Level 0 validation is accomplished by:

- Visually reviewing numeric raw data on a daily basis.

- Initially screening the data for anomalies on a daily basis.

- Visually reviewing graphed raw data on Stackplots on a weekly basis.

- Logging the receipt of data documentation from field specialists and/or site operators.

4.1.1 Daily Data Review and Anomaly Screening

Data are collected via modem or other communications and stored in computer files (see SOP 3350, *Collection of Ambient Air Quality and Meteorological Data*). Flags applied to the data by the dataloggers are also stored. The data and flags are then loaded into a temporary table in the AQDBMS database and visually reviewed by the data technician. Data for one site, one day, all parameters are displayed on the computer screen at a time. The data technician reviews the data and verifies the following:

- All sites and parameters that should be in the temporary table are in the temporary table.
- The data set for each site is complete by scrolling to the end of the day to be sure that all data are there.
- Parameter codes at the left of the screen match the data assigned to it. This includes checking for proper units, precision, accuracy, and scaling.
- The data are reasonable for the site, season and conditions.
- The correct parameter codes have been assigned to the data. If the data are correct, but the parameter code is wrong, the data for the site/day must be deleted, the parameter code corrected in the Site Configuration Table, and data for the site/day loaded again.

If data for a site have not been properly loaded, the data for the site/day must be deleted, corrected, and loaded into the temporary table again. It may be necessary to compare the data on screen with the raw computer file for verification. If data are missing and unrecoverable, the missing data is "blank filled" by using the AQDBMS manual data entry screen and program. If raw data values are to be recovered by other than digital means, for example reduced from a strip chart, the AQDBMS validation screen raw data/source view is used to enter the data.

After data for a site/day is verified, it is screened for anomalies by an AQDBMS program. This program applies anomaly flags (level 0 validation codes). These flags are added to any datalogger flags that were loaded with the raw data from the datalogger.

Specific values for the screening program are maintained in the AQDBMS Screening Ranges Table for each site/parameter combination. If a site/parameter is not defined, a message is displayed. The screening ranges table must be immediately updated and the data screened again.

After screening, the data technician notifies the field specialist if any of the following are true:

- Data for any parameter are at a full scale or zero scale values for an uncommonly long time. This indicates an instrument may have been left in zero or span mode inadvertently.

- Daily calibration data (zero and span values from the analyzer) are not within the expected range. Zero values should be within ±10% and span values within ±15% of the calibrator's corresponding values. In this case, the field specialist must be notified as soon as possible so the analyzer can be calibrated in the field.

- Other unusual and noteworthy data flags that would call attention to either a needed repair of an instrument or correction of a condition by the site operator.

Once the data have been verified, screened, and all problems reported, the data are moved to the permanent database. Corrective action is initiated to resolve any noted inconsistencies and the problem and actions are entered in the Site Status Log.

4.1.2 Review of Raw Data Stackplots

A Stackplot may include single or multiple user-selected parameters on line or bar graphs plotted against time on the x-axis. Up to 16 parameters may be plotted on up to 8 separate graphs (1 or 2 parameters per graph) in a stack. Temporal data variations are then easy to compare. Stackplots are used throughout the validation process. Raw data are graphed on Stackplots on a weekly basis for each site for the following time periods each month:

- Days 1 – 7

- Days 8 – 15

- Days 16 – 23

- Days 24 – end of month

Two copies of each plot are generated. One copy is filed in the Raw Stackplots file for each site as an original record. The other copy is promptly forwarded to all data analysts and field specialists for examination. Problems not detected up to this point in the validation process are entered into the Site Status Log and a field specialist notified for resolution of the problem. Comments regarding the data are hand written on the plots. This copy is then filed in a temporary file box in order to receive further comments later in the validation process.

4.1.3 Site Documentation

Site operators are required to submit documentation for each month within 15 days after the end of the month. If documentation is overdue for a site, the site operator is contacted and the documentation located. The documentation from a site can include:

- Strip charts

- Daily summaries

- Field station logs

- Hourly maximum forms
- Multipoint calibration forms
- Power failure logs
- Precision check lists
- SSRF forms

The documentation received is logged in the AQDBMS Data Validation Log. A log record is created for each site/month and documentation items added to the detail log noting the date received and any comments. Level 0 validation is complete for a site/month on the date all possible data for the month has been collected and loaded into the AQDBMS database and all site documentation has been received. This date is entered in the AQDBMS Data Validation Log.

4.2 PRELIMINARY VALIDATION PROCEDURES

Data for a site/month must be at Level 0 validation before beginning preliminary validation. The Preliminary Validation Checklist, shown in Figure 4-1, is used as a guide for the preliminary validation procedure. The checklist identifies the major steps taken during preliminary validation and provides a record of the date each step was completed and the initials of the analyst completing it. Preliminary data validation is accomplished by the following:

- Determining if each data value meets validation acceptance criteria by:
  - Reviewing site documentation.
  - Reviewing the AQDBMS Site Status Log.
  - Recording and reviewing comments on the raw data Stackplots.
  - Reviewing and perhaps entering precision check and calibration data into the AQDBMS database.
  - Entering and reviewing any audit report data received for the site/month into the AQDBMS database.
- Entering validation codes and perhaps adjusted values into the AQDBMS database.
- Updating the AQDBMS Data Validation Log.
- Reviewing validated data Stackplots.

Validation Checklist - Preliminary

Month/Year_____ **Site_____**

		Date	Initials
1.	Checked data and timing of strip chart(s).	_____	_____
2.	Checked Daily Summaries (all collected).	_____	_____
3.	Hand Entered/Reduced Data? Y ___ N ___	_____	_____
	Dates and Hours: _____		
4.	Reviewed Previous Commented Stackplots	_____	_____
5.	Checked Power Failure Log. (>15 minutes in any monitoring hour)	_____	_____
6.	Reviewed Control Charts (Diagnostic Plots).	_____	_____
7.	Reviewed Field Station Logs.	_____	_____
8.	Reviewed Station Check Lists.	_____	_____
9.	Check station temperature to be 19.5N C # STP # 30.5N C (API analyzers: 4.5NC # STP # 40.5N C)	_____	_____
10.	Checked Site Status Log.	_____	_____
11.	Reviewed Maximum O_3 and SO_2 forms.	_____	_____
12.	Recorded comments on plots.	_____	_____
13.	Entered validation codes/values into data base.	_____	_____
14.	Entered multipoint calibration data into database (multipoint calibrations conducted by site operator)	_____	_____
15.	Verified that any pre-maintenance calibrations (considered ARS Audit) and other audits are received and entered.	_____	_____
16.	Validation Log updated.	_____	_____
17.	Group Plot Review	_____	_____

Figure 4-1. The Preliminary Validation Checklist.

4.2.1 Validation Acceptance Criteria

Validation acceptance criteria and the methods for determining if a data value meets the criteria are usually related to one of the following events or limitations:

- Data are out of instrument specifications
- Data exceed minimum or maximum expected value
- Data exceed minimum or maximum expected rate of change
- Station temperature is out of specified limits
- Data are affected by calibration check
- Zero and span check data are within specified limits
- Less than 45 minutes of data are available (hourly averaging period)
- Instrument or datalogger was affected by acts of nature
- Instrument or datalogger was affected by power failure
- Data capture was affected by a datalogger failure
- Data were affected by operator maintenance or calibration checks
- Data were affected by site operator error
- Data were affected by instrument malfunction or failure

To determine if the data meet or do not meet validation acceptance criteria, the data analyst first reviews the site documentation and weekly Stackplots for the site/month being validated then writes any comments on the plots that affect validation. Comments on plots are based on information from the site documentation, communication with field personnel and site operators, and anomaly screening results. A commented plot is shown in Figure 4-2. The following guidelines are used when commenting plots:

- Comments are written within the outline of the day of the affected data and in close proximity to the data point affected.
- Comments include the hours affected, the reason(s) for invalidating the data, and the corresponding invalid code.
- Explanations of valid but unusual data are also included.

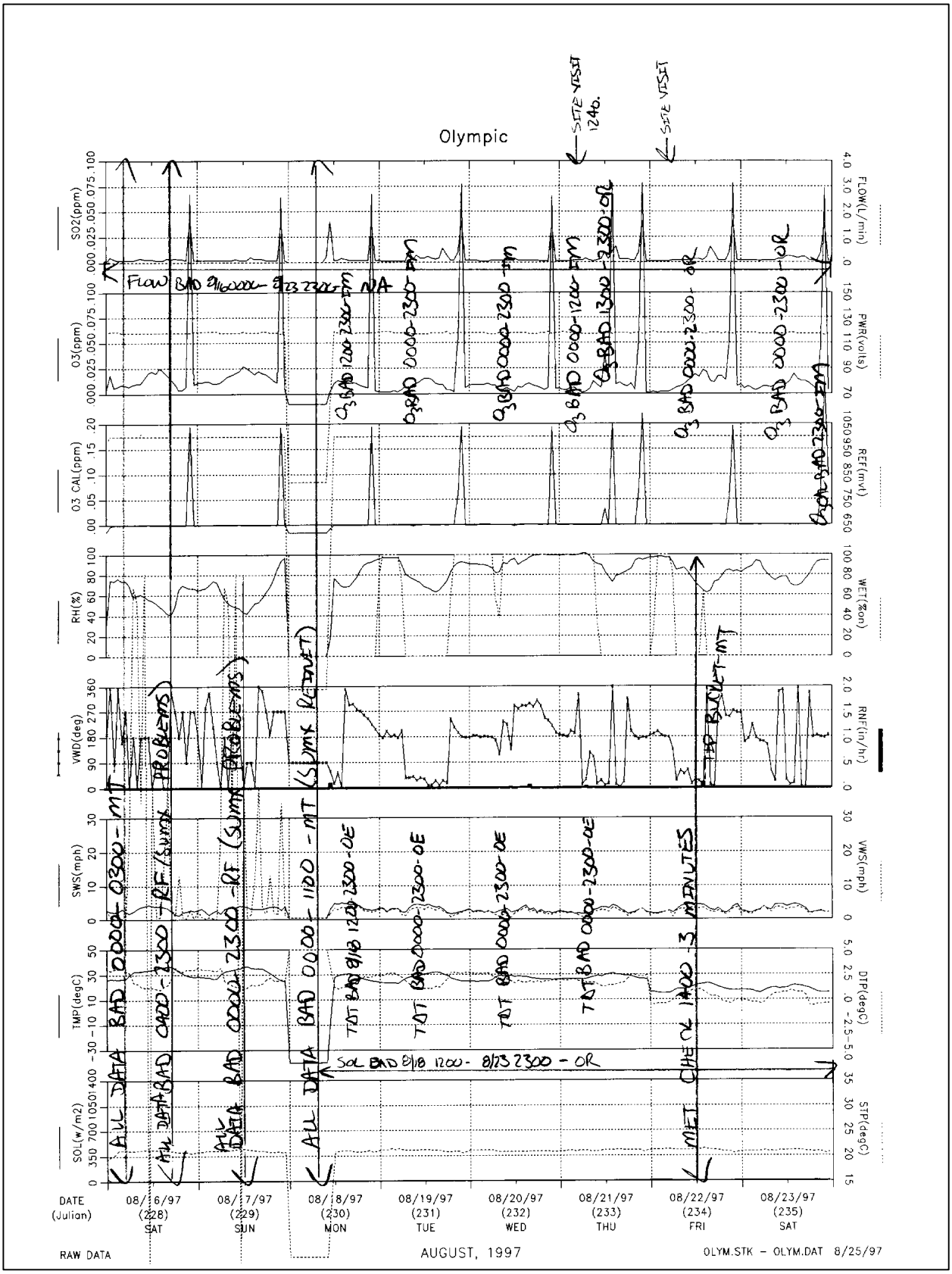

Figure 4-2. Example of a Commented Stackplot.

- Data points flagged by the anomaly-screening program are noted on the plot when appropriate.

- Site visits are identified at the top of the plot above the corresponding date with date, time, and duration of the visit.

- Normal actions that occur during a site visit and do not invalidate data are also identified on the plot (for example, meteorological instrument checks that last less than 15 minutes). This indicates that a required maintenance check was completed and further establishes validity of the data.

Precision check, calibration, and audit data are reviewed and entered if necessary during this step in the preliminary validation process.

After commenting the weekly Stackplots for a site/month, the AQDBMS Data Validation Log is updated by entering the date Stackplot comments are completed with the analyst's initials into the log record for the site/month.

4.2.2 Entering Validation Codes and Other Values into the AQDBMS Database

After commenting Stackplots, validation codes are entered into the database. The codes entered come directly from the commented Stackplots and are also guided by the datalogger and anomaly flags that are already in the database. Validation codes are entered in place of the anomaly screening and datalogger flags although sometimes an anomaly screening flags is also a validation code.

At times, raw data may need to be adjusted in order to get a correct, validated value. A situation may occur where a data point is valid, but the datalogger was scaled or initialized incorrectly. In cases when the data can be appropriately adjusted, a control value is entered in the control value field that operates on the raw value to provide an adjusted validated value. For example, if the data analyst determines the datalogger was programmed with incorrect units for a parameter, the data is not invalid but it is incorrect. A multiplier placed in the control value field is used to properly convert the data.

Additional tools for verifying complete and accurate entry of validation codes are available within the AQDBMS. The data analyst completes the following checks:

- Reviews the Data Collection Statistics Table for a site/month, to quickly detect if a code was missed for parameters that must be validated identically and to look for indications missed power failures or recorder failures.

- Reviews the High Values Tables for individual pollutant parameters to detect calibration points inadvertently left in as valid.

- Reviews validated data Stackplots to further verify that no points were missed.

All of these products can be reviewed either on screen or as printed copy. See TI ____-____, Generating Report Tables from the AQDBMS for detailed instructions.

Preliminary data validation is complete after entering validation codes for a site/month and reviewing the validated data output. The AQDBMS Data Validation Log is then updated by entering the date completed and the analyst's initials into the log record for the site/month.

4.3 FINAL VALIDATION PROCEDURES

Data for a site/month must be at preliminary validation before beginning final validation. The Final Validation Checklist, shown in Figure 4-3, is used as a guide for the final validation procedure. The checklist identifies the major steps taken during final validation and provides a record of the date each step was completed and the initials of the analyst completing it. Final validation is accomplished by the following:

- A group plot review that includes input from air quality specialists, field specialists, and site operators to resolve all questionable validation issues.
- Making necessary validation code changes in the AQDBMS database based on the group plot review discussion.
- Generating and reviewing monthly data reports.

The monthly reports are mailed to the site operators who then have two weeks to review the reports and submit commits. If comments are received, the data remains at a preliminary level of validation until all questions/problems are resolved. If no comments are received or once all questions/problems are resolved, the data are considered final. The AQDBMS Data Validation Log is then updated by entering the date completed and the analyst's initials into the log record for the site/month. The monthly data reports are stamped with the final validation stamp in the upper right hand corner of the cover page and filed. At the final validation level, the data can be uploaded to AIRS (See TI ____-____, Submitting Ambient Air Quality and Meteorological Data to the EPA-AIRS Database) and can be included in data requests (See TI ____-____, Servicing Ambient Air Quality and Meteorological Data Requests).

4.4 POST-FINAL VALIDATION PROCEDURES

If a validation error is found after the data are labeled as final, the following steps are taken:

- The final validation date in the validation log for the site/month is deleted.
- The necessary changes are made in the AQDBMS database.
- A detail log record explaining the changes made is added to the Data Validation Log for the site/month.
- A new final validation date is entered in the Data Validation Log for the site/month.

Validation Checklist - Final

Month/Year_____ **Site**_____

Date of Validation_____ **Initials**_____

		Date	**Initials**
1.	Checked Preliminary Validation Checklist.	_____	_____
2.	Review plots with comments	_____	_____
3.	Verify preliminary edits.	_____	_____
4.	Verify preliminary invalid data codes.	_____	_____
5.	Run validated data plots for monthly report.	_____	_____
6.	Data Validation Log updated.	_____	_____
7.	Comments:_____		
	_____		
	_____		
	_____		
	_____		
8.	Review comments from Monthly Report	_____	_____
9.	Data Validation Log updated.	_____	_____
10.	Create updated plots.	_____	_____

Figure 4-3. The Final Validation Checklist.

- The changes are explained in the comments section of the Final Validation Checklist for the site/month.

- The monthly report pages that were affected by the change are regenerated and replaced in the report on file. A copy of each changed page is also sent to the recipients of the monthly report with a cover letter explaining the changes and the need to replace the page(s) in their copy of the report.

- A note with the date and analysts initials is attached to the cover of the monthly data report explaining the changes made.

- If the affected data has been submitted to the EPA-AIRS Database, they must be resubmitted.

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1.0 PURPOSE AND APPLICABILITY

This technical instruction (TI) describes the steps taken by the National Park Service (NPS) Air Resources Division's (ARD) Information Management Center (IMC) for completing Level 0 validation of ambient air quality and meteorological data. These steps apply to all ambient air quality and meteorological parameters that are monitored and loaded into the Air Quality Database Management System (AQDBMS), regardless of whether the data for a specific parameter is uploaded to the EPA AIRS database. This TI is referenced from SOP 3450, *Collection of Air Quality and Meteorological Data*, and SOP 3450, *Ambient Air Quality and Meteorological Data Validation*.

The steps taken to complete Level 0 data validation are:

- Loading or entering data into the AQDBMS.
- Reviewing raw data visually on a near daily basis for data collection errors and for details on instrument performance.
- Screening the data for anomalies.
- Collecting and logging site documentation.

2.0 RESPONSIBILITIES

2.1 DATA COORDINATOR

The data coordinator shall:

- Update information in the Site Configuration Table of the AQDBMS as needed.
- Update Stackplot configuration files as needed.
- Review Stackplots.

2.2 DATA ANALYST

The data analyst shall review Stackplots.

2.3 DATA TECHNICIAN

The data technician shall on a near daily basis:

- Collect digital data.
- Load data into the database.
- Run the anomaly screening program on the data.

- Blank fill missing data as necessary.
- Print and review Stackplots.
- Collect and log field documentation.
- File all hard copies.
- Update the Data Validation Log in the AQDBMS with the Level 0 validation date.

2.4 FIELD SPECIALIST

The field specialist shall review Stackplots.

2.5 TECHNICAL ASSISTANT

The technical assistant shall:

- Enter appropriate information into the Site Status Log.
- Print out trip reports and give to the data coordinator.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 THE AIR QUALITY DATABASE MANAGEMENT SYSTEM (AQDBMS)

The Air Quality Database Management System (AQDBMS) is the primary tool used to validate ambient air quality and meteorological data. The Air Quality Database Management System (AQDBMS) is comprised of two main components:

- An Oracle database specifically designed and developed by Air Resource Specialists (ARS) to hold air quality network data and to accommodate the many temporal, spatial, and functional variations found within an air quality network.
- Customized software programs developed by Air Resource Specialists that provide an interface to the Oracle database.

3.1.1 System Hardware Requirements

The AQDBMS requires the following hardware:

- Workstations - Networked Intel Pentium-based workstations with at least 16MB of RAM (32MB recommended), 1024 x 768 resolution (recommended large fonts, 17 inch or larger monitor), 40MB of available hard disk space, and a mouse.

- Database Server - An Intel Pentium-based database server with hard disks providing at least 2 gigabytes of storage and at least 48MB of RAM, color monitor, mouse, CD-ROM, and back-up device.

- Reporting - High-resolution laserjet or inkjet printer for printing.

3.1.2 System Software Requirements

The AQDBMS requires the following commercial software:

- PC operating system - Microsoft Windows95.

- Network operating system - Novell Netware 3.12 or 4.11; IPX protocol.
- Database engine - The Oracle 7 (version 7.2 or 7.3) Workgroup Server for Netware Relational Database Management System (RDBMS).

- Database connectivity - Oracle SQL*Net (version 2.2 or 2.3) IPX protocol adapter. Oracle ODBC Driver for Oracle version 2.05 or later.

- User interface - Powersoft PowerBuilder version 5.0.02 run-time libraries. Microsoft VisualBasic version 5.0 run-time libraries.

The AQDBMS requires the following ARS-developed software:

- User interface for loading, screening, validation, reporting, creation of AIRS files, etc. – PowerBuilder executables (ESD.exe and .PBD files). VisualBasic executables (vbrose32.exe, diur32.exe, vbbar32.exe, stkwin.exe vbsum32.exe).

4.0 METHODS

This section discusses the methods used to complete Level 0 data validation of air quality and meteorological data (see Figure 4-1). This section contains the following nine (9) major subsections:

4.1 The Data Validation Log
4.2 The Site Status Log
4.3 Loading and Entering Data into the AQDBMS Database
4.4 Data Review
4.5 Anomaly Screening
4.6 Moving Data from the Temporary to the Permanent Table
4.7 Review of Raw Data Stackplots
4.8 Site Documentation
4.9 Loading Data from Other Sources

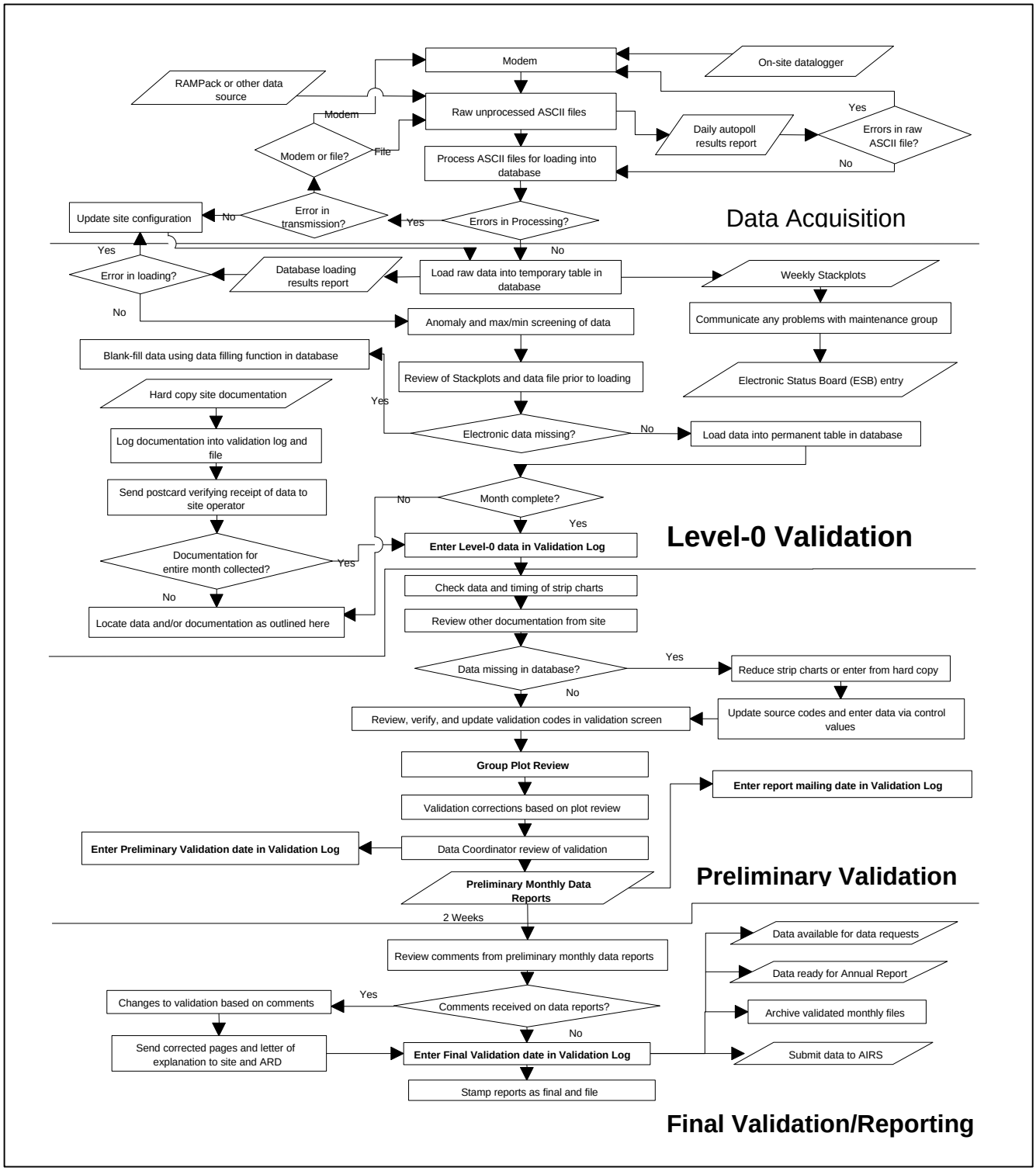


Figure 4-1. NPS Ambient Air Quality and Meteorological Monitoring Network Data Collection, Validation, and Reporting Flow Diagram.

4.1 THE DATA VALIDATION LOG

The Data Validation Log is used to track the completion of each major step of the validation process. The master record logs the initials of the data technician completing each validation step and when it occurred. The detail table logs the receipt of the various supporting documents received from the field specialist and/or site operator. The log entry for a particular site/month must exist before data can be edited in the Data Validation Window. See *Section 4.0 Using the Data Validation Log* in the *AQDBMS User's Guide* (ARS, 1997) for detailed instructions.

4.2 THE SITE STATUS LOG

The Site Status Log is a diary of site-related events such as instrument malfunctions and repairs, data adjustments, calibrations, special site visits, weather episodes, etc. that may be relevant to data validation. A basic description of each event is entered as a record in the master table. The master record contains the site number and name, a reference number assigned by the program, date started and stopped fields to define the period of time involved and an affected parameters field to indicate which data parameters may be affected by the event. There is also a field to indicate if the event is considered to be a problem or not. This field is used to quickly create a list of current problems found in the log. The detail table holds as many records as needed to record notes about each event. Normally, a master record will have at least one detail record. Entries can be added, modified, or deleted in both the master and the detail tables. See *Section 5.0 Using the Site Status Log* in the *AQDBMS User's Guide* (ARS, 1997) for detailed instructions.

4.3 LOADING AND ENTERING DATA INTO THE AQDBMS DATABASE

Data are collected daily via modem and stored in computer files as explained in TI 3350-4000, *Collection of Ambient Air Quality and Meteorological Data via Telephone Modem*. Flags applied to the data by the dataloggers are also stored. The data and flags are then loaded into a temporary table in the AQDBMS. To correctly load data, each site currently being monitored must be properly defined in the AQDBMS Site Configuration Table.

Several methods exist for placing data into the Oracle database. Usually, hourly data are loaded into a temporary table in the Oracle database for all sites for one day at a time using the "Auto Load" command. Data can also be loaded for one site for one day at a time using the "Manual Load" command. Sometimes, data cannot be acquired electronically and must be hand entered from daily printouts or strip charts. As a last resort, data collected by another agency co-located at a site can be entered into the Oracle database. If data can not be acquired by any means, the missing data is "blank filled". All of these methods are accomplished through commands found in the AQDBMS application.

4.3.1 The Site Configuration Table

The AQDBMS Site Configuration Table holds constant site information such as name, longitude and latitude, and AIRS codes. Figure 4-2 shows an example site configuration record. A record exists in this table for each site with data in the database. For each current site, the "include in auto load" switch is ON and the record also contains information on each column of the site's datalogger. The fields of information stored are:

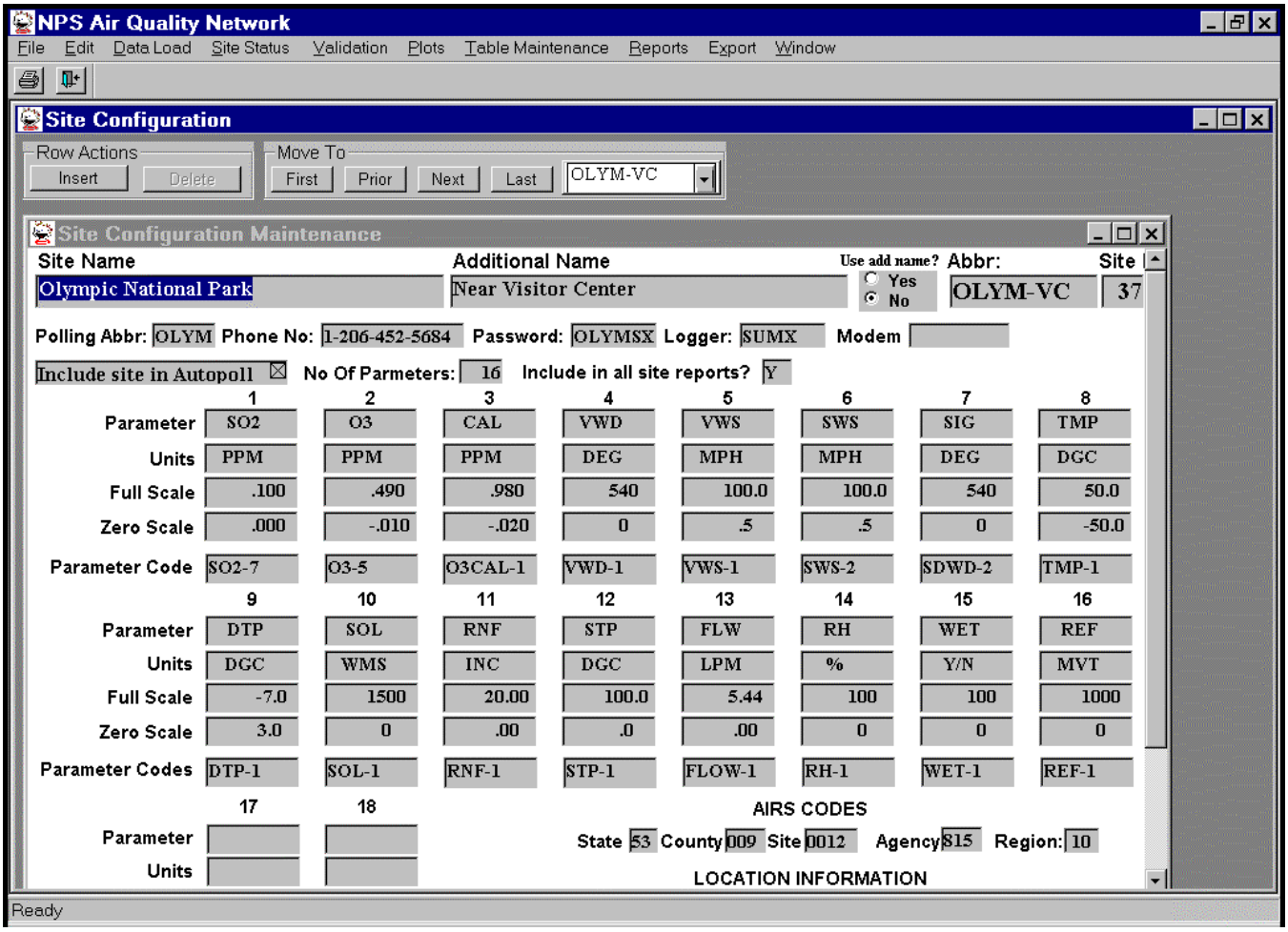


Figure 4-2. Example Site Configuration Record in the AQDBMS Database.

- Datalogger column label (such as WS wind speed)
- Datalogger column units (such as MPH for miles per hour)
- Datalogger zero scale value
- Datalogger full scale value
- Database assigned parameter code (such as SWS-1 defined in the database as scalar wind speed in miles per hour)

As data are loaded into the database, the computer program compares the column labels in each site's ASCII file with the column information in the Site Configuration Table. If a mismatch between a site's ASCII file and site configuration record is encountered, all data for the site/day are rejected and an error message is written to a file. For information on how to modify the Site Configuration Table, see the *AQDBMS User's Guide* (ARS, 1997).

4.3.2 Using Auto Load

The "Auto Load" command loads hourly data for a given day for currently monitored sites from ASCII files (such as BIBE0601.97D for Big Bend NP June 1997) into a temporary table in the Oracle database. Zero, span and precision check data are also loaded from ASCII files (such as BIBE0601.97L). The ASCII files must reside in the \\ars net3\vol2\projects\npsair\dpc\final folder. The program also writes to a message file in this folder that can be viewed in any text editor. To run Auto Load:

- Copy the ASCII files to the \\ars net3\vol2\projects\npsair\dpc\final folder.
- On the Data Load menu, click **Auto Load**.
- Type in the date in m/d/yy format (that is 6/1/97 or 06/01/97 for June 1, 1997) and then press **Enter** or click **OK**.
- Review the message file when the program is finished.

4.3.3 Using Manual Load

The "Manual Load" command loads hourly data for a given site for a given day from an ASCII (such as BIBE0601.97D) into a temporary table in the Oracle database. Zero, span and precision check data are also loaded from an ASCII files (such as BIBE0601.97L). This command is useful if the file for a site/day did not exist or contained errors when the Auto Load command was ran for the given day. The files must reside in the \\ars net3\vol2\projects\npsair\dpc\final directory. The program also writes to a message file in this directory that can be viewed in any text editor.

To run Manual Load:

- On the "Data Load" menu, click **Manual Load**.
- Type the four-character site abbreviation (the polling abbreviation in the Site Configuration Table) and then press **Enter** or click **OK**.
- Type the date in m/d/yy format (that is 6/1/97 or 06/01/97 for June 1, 1997) and then press **Enter** or click **OK**.
- Review the message file after the program finishes.

4.3.4 Correcting Data Loading Errors

The Auto Load and Manual Load programs write messages to a file indicating the successes and failures of the processes. The file is called AQyymmdd.ORC where yy are the last two digits of the year, mm the month number and dd the day number. (For example, the file AQ970601.ORC holds messages for June 1, 1997.) This file is written to the \\ars net3\vol2\projects\npsair\dpc\final folder and can be viewed in any text editor. Examples of possible messages and actions to take are:

Message:	Data for BIBE 06/01/97 loaded into temporary table
Action:	None
Message:	Full scale in datalogger column 8 does not match full scale column 8 in site configuration.
Action:	Modify the site's site configuration record to match the full scale value of column 8 to the column 8 full scale header in the ASCII file. See Section 4.1.1, Site Configuration Table above.

4.3.5 Blank Filling Data

If data cannot be collected electronically, it is "blank filled" at this time with raw values of -999. Later, the blank filled data may be replaced with raw values reduced from strip chart, daily data printouts, or data from third-party sources (see Section 4.5). To blank fill data, use the "Data Entry" command in the AQDBMS application.

The "Data Entry" command displays a form for entering hourly data into the temporary or permanent table in the Oracle database. Two methods for entering data are available. The pattern date method is typically used for blank filling and requires the user to enter a date to pattern the new records on. When the enter button on the form is clicked, the program queries the permanent table in the Oracle database for a list of parameter codes for the given site and date and then creates one record for each parameter code for each hour between the start and stop times given. The single parameter code method allows the user to select a parameter code from a list. When you click the **Enter** button, only records for the selected parameter are created for each hour between the start and stop times.

To Use the Data Entry Form:

- On the “Data Load” menu, click **Data Entry**.
- The data entry form appears.
- Click the **down arrow** in the “Site” box and select a site from the list.
- In the “Start Date/Time” box, type the **start date and hour** in mm/dd/yy hh format (such as 06/01/97 00 for June 1, 1997 hour 0) .
- In the “End Date/Time” box, type the **end date and hour** in mm/dd/yy hh format (such as 06/03/97 23 for June 3, 1997 hour 23).
- In the “Raw Val” box, type the **raw value** (default is -999 for blank filling records) to be entered.
- Click the “Source Code” box and select a source code from the list. The default value is “B” for blank filled.

To use the Pattern Date Method:

- In the “Pattern” box, type a date in mm/dd/yy format to create records for all parameter codes found on this date.
- Click **Enter**.

Important: Data for the selected site and pattern date must exist in the permanent table of the database.

To use the Single Parameter Code Method:

- Click the **down arrow** in the “Par Code” box and select a parameter code form the list.
- Click **Enter**.

To Finish:

- To blank fill data into the permanent table, click the **Write to permanent table** check box. Otherwise, the blank fill will be written to the temporary table.
- Click the **Enter** button.

4.4 DATA REVIEW

Typically, data are collected via modem and stored in computer files. Flags applied to the data by the dataloggers are also stored. Table 4-1 is a list of datalogger flags. The data and flags are then loaded into a temporary table in the AQDBMS database and visually reviewed by the data technician. Data for one site, one day, all parameters are displayed on the computer screen at a time. Figure 4-3 is an example of the Data Review Screen.

To Review Data:

- Select **Review Data** from the "Data Validation" menu.
- In the "Enter Date To Get" dialog box, enter a date in m/d/yy format (such as 6/1/97 for June 1, 1997.)
- The "Review Data" window displays data for all parameters for the given date for one site at a time. The site initially displayed is the one with the lowest site number.

  Note: A message is displayed if no data for the given date is found in the temporary file.

  Tip: To display data for a different site, click the **down arrow** in the "Site" box and select a site from the list. Data for the selected site/date is displayed or a message are displayed indicating data for the selected site/date was not found in the temporary table.

  Tip: Click the **Change Date** button at any time when working in the "Review Data" window to select a different date to work on.

- Use the horizontal and vertical bars to scroll through the data. Review the data and verify the following:

  - All sites and parameters that should be in the temporary table are in the temporary table.
  - The data set for each site is complete by scrolling to the end of the day to be sure that all data are there.
  - Parameter codes at the left of the screen match the data assigned to it. This includes checking for proper units, precision, accuracy, and scaling.
  - The data are reasonable for the site, season and conditions.
  - The correct parameter codes have been assigned to the data. If the data are correct, but the parameter code is wrong, the data for the site/day must be deleted, the parameter code corrected in the Site Configuration Table, and data for the site/day loaded again.

If data for a site have not been properly loaded, the data for the site/day must be deleted, corrected, and loaded into the temporary table again. It may be necessary to compare the data on screen with the raw computer file for verification.

Table 4-1
Datalogger Flags

Flag	Description
-	Low alarm.
#	Insufficient data.
*	Out of calibration.
/	Rate-of-change alarm.
^	High alarm.
_	Low alarm.
<	Missing data.
B	Bad input status.
C	Calibration.
D	Parameter marked down.
F	Power failure
P	Purge.
Z	Zero/span.

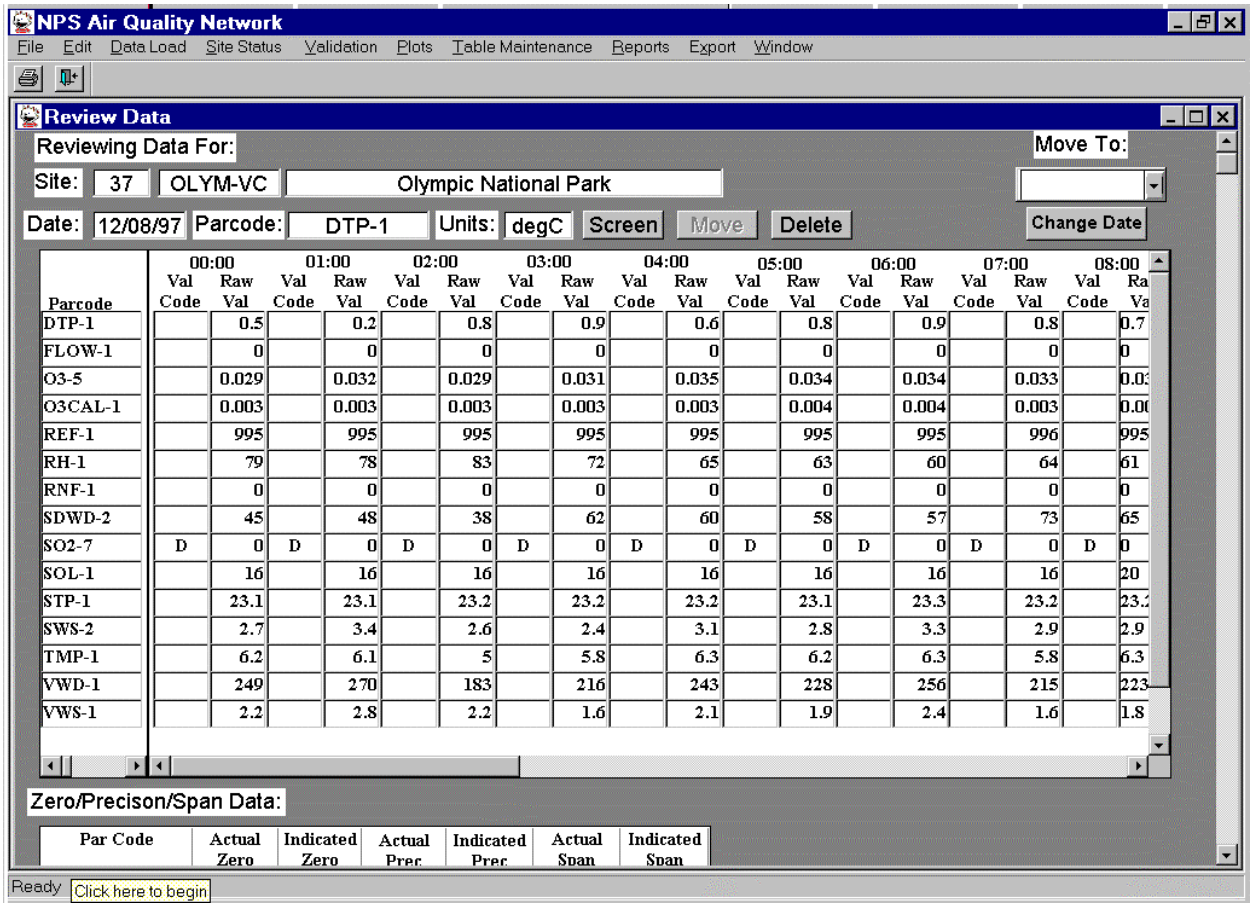


Figure 4-3. Example Review Data Screen in the AQDBMS.

4.5 ANOMALY SCREENING

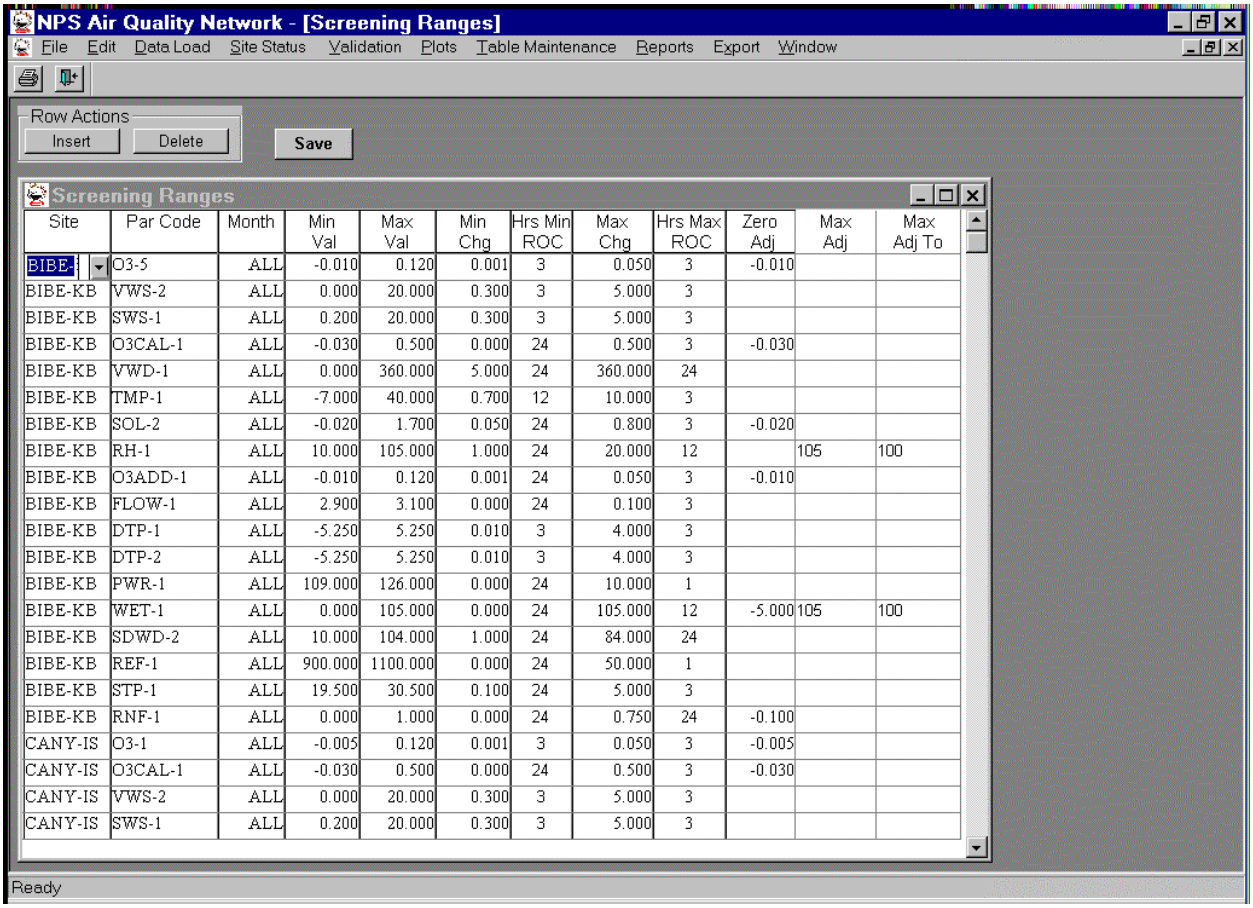
After data for a site/day are verified, they are screened for anomalies by an AQDBMS program. This program applies anomaly flags (Level 0 validation codes). These flags are added to any datalogger flags that were loaded with the raw data from the datalogger. The screening program uses values stored in the AQDBMS Screening Ranges Table. Figure 4-4 shows example records from this table. It contains the screening ranges for each current site and parameter code, which allows each screening element to be defined independently from the other. Each record contains the following fields of information:

- Minimum expected value
- Maximum expected value
- Minimum rate of change
- Minimum rate of change hours
- Maximum rate of change
- Maximum rate of change hours
- Zero adjust value (does not apply to all parameters)
- Maximum adjust value (does not apply to all parameters)

To screen the data for anomalies, click the **Screen** button. The program looks up acceptable ranges of values in the Screening Ranges Table and flags anomalies. The program also compares the values of certain parameters and applies flags as needed. Table 4-2 is a list of the anomaly flags. The program stops and a message is displayed if screening ranges have not been defined for a site/parameter combination. In this case, update the screening ranges table and run the screening program again.

To modify a screening ranges record:

- Select **Screening Ranges** from the ”Table Maintenance” menu. The screening ranges table is displayed and sorted by site/parameter.
- Find the site/parameter code combination that needs to be modified. Click in the field to modify, delete the old value, and type a new value.
- Click the **Save** button.



Site	Par Code	Month	Min Val	Max Val	Min Chg	Hrs Min ROC	Max Chg	Hrs Max ROC	Zero Adj	Max Adj	Max Adj To
BIBE-	O3-5	ALL	-0.010	0.120	0.001	3	0.050	3	-0.010		
BIBE-KB	VWS-2	ALL	0.000	20.000	0.300	3	5.000	3			
BIBE-KB	SWS-1	ALL	0.200	20.000	0.300	3	5.000	3			
BIBE-KB	O3CAL-1	ALL	-0.030	0.500	0.000	24	0.500	3	-0.030		
BIBE-KB	VWD-1	ALL	0.000	360.000	5.000	24	360.000	24			
BIBE-KB	TMP-1	ALL	-7.000	40.000	0.700	12	10.000	3			
BIBE-KB	SOL-2	ALL	-0.020	1.700	0.050	24	0.800	3	-0.020		
BIBE-KB	RH-1	ALL	10.000	105.000	1.000	24	20.000	12		105	100
BIBE-KB	O3ADD-1	ALL	-0.010	0.120	0.001	24	0.050	3	-0.010		
BIBE-KB	FLOW-1	ALL	2.900	3.100	0.000	24	0.100	3			
BIBE-KB	DTP-1	ALL	-5.250	5.250	0.010	3	4.000	3			
BIBE-KB	DTP-2	ALL	-5.250	5.250	0.010	3	4.000	3			
BIBE-KB	PWR-1	ALL	109.000	126.000	0.000	24	10.000	1			
BIBE-KB	WET-1	ALL	0.000	105.000	0.000	24	105.000	12	-5.000	105	100
BIBE-KB	SDWD-2	ALL	10.000	104.000	1.000	24	84.000	24			
BIBE-KB	REF-1	ALL	900.000	1100.000	0.000	24	50.000	1			
BIBE-KB	STP-1	ALL	19.500	30.500	0.100	24	5.000	3			
BIBE-KB	RNF-1	ALL	0.000	1.000	0.000	24	0.750	24	-0.100		
CANY-IS	O3-1	ALL	-0.005	0.120	0.001	3	0.050	3	-0.005		
CANY-IS	O3CAL-1	ALL	-0.030	0.500	0.000	24	0.500	3	-0.030		
CANY-IS	VWS-2	ALL	0.000	20.000	0.300	3	5.000	3			
CANY-IS	SWS-1	ALL	0.200	20.000	0.300	3	5.000	3			

Figure 4-4. Example Records in the Screening Ranges Table.

Table 4-1
Anomaly Screening Flags

Flag	Description
XV	Greater than the maximum value in the screening ranges table.
DT	Dewpoint value is more than 2.5 degrees C greater than temperature.
NR	Rate of change less than minimum value in the screening ranges table.
NV	Less than minimum value in the screening ranges table.
WS	Scalar wind speed greater than Vector wind speed - generated by the screening program
IM	Set in VWS, VWD, and SDWD when SWS < min. expected (NV)
XR	Rate of change greater than the maximum value in the screening ranges table.
TH	Data invalid for ozone when station temp is > 30.5 deg C.
TL	Data invalid for ozone when station temperature < 19.5 degrees C.
VM	Valid but the validated value has been adjusted for the max value by the screening program based on the max_adj, max_adj_to, and max_val fields of the screening ranges table
VZ	Valid but the validated value has been adjusted for zero by the screening program based on the zero adjustment value in the screening ranges table

To define a new site/parameter code combination record in the screening ranges table:

- Select **Screening Ranges** from the "Table Maintenance" menu. The screening ranges table is displayed sorted by site/parameter.
- Click the **Insert** button.
- Click the **down arrow** in the "Site" box, then select the site abbreviation for the affected site.
- Click the **down arrow** in the "Par Code" box, then select the affected parameter code.
- Enter values in each of the required fields for the parameter code.

After screening, the data technician notifies the field specialist if any of the following are true:

- Data for any parameter are at a full scale or zero scale values for an uncommonly long time. This indicates an instrument may have been left in zero or span mode inadvertently.
- Daily calibration data (zero and span values from the analyzer) are not within 25% of the calibrator's corresponding values. In this case, the field specialist must be notified as soon as possible so the analyzer can be calibrated in the field.
- Other unusual and noteworthy data flags that would call attention to either a needed repair of an instrument or correction of a condition by the site operator.

Once the data have been verified, screened, and all problems reported, the data are moved to the permanent database. Corrective action is initiated to resolve any noted inconsistencies and the problem and actions are entered in the AQDBMS Site Status Log.

4.6 MOVING DATA FROM THE TEMPORARY TO THE PERMANENT TABLE

After data have been reviewed, verified, and screened, they are moved from the temporary database table with all datalogger and anomaly screening flags into the permanent database table. To move data to the permanent database table click the **Move** button. The program moves the data from the temporary table to the permanent table. Data for the next lowest site number for the given date are displayed or a message is displayed indicating no more data can be found in the temporary table for the given date. A message is displayed if you attempt to move data into the permanent table and the data already resides in the permanent table. In this case, click the **Delete** button to delete the data from the temporary table.

4.7 REVIEW OF RAW DATA STACKPLOTS

A Stackplot may include single or multiple user-selected parameters on line or bar graphs plotted against time on the x-axis. Up to 16 parameters may be plotted on up to 8 separate graphs (1 or 2 parameters per graph) in a stack. Temporal data variations are then easy to compare. Stackplots are used throughout the validation process. Raw data are graphed on Stackplots on a weekly basis for each site for the following time periods each month:

- Days 1 – 7
- Days 8 – 15
- Days 16 – 23
- Days 24 – end of month

Two copies of each plot are generated. One copy is filed in the Raw Stackplots File for each site as an original record. The other copy is promptly forwarded to all data analysts and field specialists for examination. Problems not detected up to this point in the validation process are entered into the Site Status Log and a field specialist notified for resolution of the problem. Comments regarding the data are hand written on the plots. This copy is then filed in a temporary file box in order to receive further comments later in the validation process. For instructions on running the Stackplot graphics program, see the *AQDBMS User's* Guide (ARS, 1997).

4.8 SITE DOCUMENTATION

Site operators are required to submit documentation for each month within 15 days after the end of the month. If documentation is overdue for a site, the site operator is contacted and the documentation located. The documentation from a site can include:

- Strip charts
- Daily summaries
- Field station logs
- Hourly maximum forms
- Multipoint calibration forms
- Power failure logs
- Precision check lists
- SSRF forms

The documentation received is logged in the AQDBMS Data Validation Log. A log record is created for each site/month and documentation items added to the detail log noting the date received and any comments. Level 0 validation is complete for a site/month on the date all possible data for the month have been collected and loaded into the AQDBMS database and all site documentation has been received. This date is entered in the AQDBMS Data Validation Log.

4.9 LOADING DATA FROM OTHER SOURCES

As discussed in SOP 3350, *Collection of Ambient Air Quality and Meteorological Data*, if data cannot be collected electronically, they are hand-entered from a daily data printout or strip chart output received from the site. Site operators are required to create data printouts each day and send them to the IMC. When necessary, data are entered directly into the database from the printouts received. If daily printouts are <u>not</u> available and if an analog or digital strip chart <u>is</u> available, the strip chart can be reduced to provide the data. Typically, ambient air quality parameters are backed up with a strip chart recording. Meteorological parameters are not always recorded on strip charts. If a valid strip chart is available and the time on it is correct and distinguishable, the data are reduced onto a missing data form and then manually entered into the database as raw data. To manually enter data from a daily printout or strip chart:

- Select **Monthly Validation** from the "Validation" menu.
- Enter the month to get (1 through 12) in the dialog box.
- Enter the year to get (in yyyy format) in the dialog box. An empty validation screen is displayed.
- Click the **arrow** in the "Retrieve Site" box and select the site to retrieve.
- After 30 seconds or so, data for the first parameter (in alphabetical order) for the selected site displays in the "Val Code" window.

  Note: A message displays if no data for the selected site/month/year are found.

  Important: A message displays notifying you that the window will be read only if no Data Validation Log record for the site/month can be found. To enter or edit data, you must first go to the "Data Validation Log" and create a record for the site/month. See Section 4.1 The Data Validation Log for more information. Once this is done, re-retrieve the site/month.
- Click the **arrow** in the "Par Code" box and select the affected parameter code.
- Click the **arrow** in the "Select View" box and select **Val Code/Raw/Source**.
- Enter the appropriate source code in the source field for each affected date and time. Use "P" for printout and "C" for strip chart.
- Enter the data value in the raw value field for each affected date and time.

If data are unavailable from all other sources, data collected by another agency collocated at a site can be entered into the Oracle database. This “third-party” data should only be used if similar instruments at similar heights were used to collect it. In this case, the data coordinator verifies the suitability of the data, acquires digital data from the third-party, then notifies the database administrator who writes a custom data loading program and loads the data. As the data are loaded, an appropriate source code is assigned to define its source. Since each case is unique, there are no additional standard steps for loading the data.

5.0 REFERENCES

Air Resource Specialists, Inc. (ARS), 1997, AQDBMS User’s Guide.

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1.0 PURPOSE AND APPLICABILITY

This technical instruction (TI) describes the steps taken by the National Park Service (NPS) Air Resources Division's (ARD) Information Management Center (IMC) for completing preliminary validation of ambient air quality and meteorological data. These steps apply to all ambient air quality and meteorological parameters that are monitored and loaded into the Air Quality Database Management System (AQDBMS), regardless of whether the data for a specific parameter is uploaded to the EPA AIRS database. This TI is referenced from SOP 3450, *Collection of Air Quality and Meteorological Data*, and SOP 3450, *Ambient Air Quality and Meteorological Data Validation*.

This TI presents the detailed steps used to ensure high quality preliminary data validation of ambient air quality and meteorological data. Data for a site/month must be at Level 0 validation before beginning preliminary validation. The Preliminary Validation Checklist is used as a guide for the preliminary validation procedure. The checklist identifies the major steps taken during preliminary validation and provides a record of the date each step was completed and the initials of the analyst completing it. Preliminary data validation is accomplished by the following:

- Determining if each data value meets validation acceptance criteria by:
  - Reviewing site documentation including daily summaries, trend-graphs, and edit logs.
  - Reviewing the AQDBMS Site Status Log.
  - Recording and reviewing comments on the raw data Stackplots.
  - Reviewing and perhaps entering precision check and calibration data into the AQDBMS database.
  - Entering and reviewing any audit report data received for the site/month into the AQDBMS database.
- Entering validation codes and perhaps adjusted values into the AQDBMS database.
- Updating the AQDBMS Data Validation Log.
- Reviewing validated data Stackplots and other output.

2.0 RESPONSIBILITIES

2.1 DATA COORDINATOR

The data coordinator shall:

- Review annotations made on Stackplots by the data technician and data analyst.
- Review validation codes entered into the AQDBMS by the data technician and data analyst.

- Verify hand-entered data values.
- Update the Data Validation Log in the AQDBMS with the preliminary validation date.

2.2 DATA ANALYST

The data analyst shall:

- Annotate Stackplots using field documentation.
- Update the Data Validation Log in the AQDBMS with the Stackplots commented date.
- Enter validation codes into the AQDBMS based on the Stackplot annotations.
- Review annotated Stackplots with the field specialist.
- Respond to questions posed during the plot review.

2.3 DATA TECHNICIAN

The data technician shall:

- Annotate Stackplots using field documentation.
- Update the Data Validation Log in the AQDBMS with the Stackplots commented date.
- Enter validation codes into the AQDBMS based on the Stackplot annotations.
- Review annotated Stackplots with the field specialist.
- Post annotated Stackplots on the bulletin board.
- Respond to questions posed during the plot review.

2.4 FIELD SPECIALIST

The field specialist shall:

- Review annotated Stackplots with the data analyst and data technician before the plot review.
- Respond to questions posed during the plot review.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 THE AIR QUALITY DATABASE MANAGEMENT SYSTEM (AQDBMS)

The Air Quality Database Management System (AQDBMS) is the primary tool used to validate ambient air quality and meteorological data. The Air Quality Database Management System (AQDBMS) is comprised of two main components:

- An Oracle database specifically designed and developed by Air Resource Specialists (ARS) to hold air quality network data and to accommodate the many temporal, spatial, and functional variations found within an air quality network.

- Customized software programs developed by Air Resource Specialists that provide an interface to the Oracle database.

3.1.1 System Hardware Requirements

The AQDBMS requires the following hardware:

- Workstations - Networked Intel Pentium-based workstations with at least 16MB of RAM (32MB recommended), 1024 x 768 resolution (recommended large fonts, 17 inch or larger monitor), 40MB of available hard disk space, and a mouse.

- Database Server - An Intel Pentium-based database server with hard disks providing at least 2 gigabytes of storage and at least 48MB of RAM, color monitor, mouse, CD-ROM, and back-up device.

- Reporting - High-resolution laserjet or inkjet printer for printing.

3.1.2 System Software Requirements

The AQDBMS requires the following commercial software:

- PC operating system - Microsoft Windows95.

- Network operating system - Novell Netware 3.12 or 4.11; IPX protocol.

- Database engine - The Oracle 7 (version 7.2 or 7.3) Workgroup Server for Netware Relational Database Management System (RDBMS).

- Database connectivity - Oracle SQL*Net (version 2.2 or 2.3) IPX protocol adapter. Oracle ODBC Driver for Oracle version 2.05 or later.

- User interface - Powersoft PowerBuilder version 5.0.02 run-time libraries. Microsoft VisualBasic version 5.0 run-time libraries.

The AQDBMS requires the following ARS-developed software:

- User interface for loading, screening, validation, reporting, creation of AIRS files, etc. – PowerBuilder executables (ESD.exe and .PBD files). VisualBasic executables (vbrose32.exe, diur32.exe, vbbar32.exe, stkwin.exe vbsum32.exe).

4.0 METHODS

Data for a site/month must be at Level 0 validation before beginning preliminary validation (see Figure 4-1). The Preliminary Validation Checklist, shown in Figure 4-2, is used as a guide for the preliminary validation procedure. The checklist identifies the major steps taken during preliminary validation and provides a record of the date each step was completed and the initials of the analyst completing it. This section discusses the methods used to complete preliminary data validation of air quality and meteorological data. This section contains the following five (5) subsections:

4.1 The Data Validation Log
4.2 The Site Status Log
4.3 Validation Acceptance Criteria
4.4 Entering Validation Codes and Other Values into the AQDBMS Database
4.5 Reviewing Validated Data Stackplots and Other Output

4.1 THE DATA VALIDATION LOG

The Data Validation Log is used to track the completion of each major step of the validation process. The master record logs the initials of the data technician completing each validation step and when it occurred. The detail table logs the receipt of the various supporting documents received from the field specialist and/or site operator. The log entry for a particular site/month must exist before data can be edited in the Data Validation Window. See *Section 4.0 Using the Data Validation Log* in the *AQDBMS User's Guide* (ARS, 1997) for detailed instructions.

4.2 THE SITE STATUS LOG

The Site Status Log is a diary of site-related events such as instrument malfunctions and repairs, data adjustments, calibrations, special site visits, weather episodes, etc. that may be relevant to data validation. A basic description of each event is entered as a record in the master table. The master record contains the site number and name, a reference number assigned by the program, date started and stopped fields to define the period of time involved and an affected parameters field to indicate which data parameters may be affected by the event. There is also a field to indicate if the event is considered to be a problem or not. This field is used to quickly create a list of current problems found in the log. The detail table holds as many records as needed to record notes about each event. Normally, a master record will have at least one detail record. Entries can be added, modified, or deleted in both the master and the detail tables. See *Section 5.0 Using the Site Status Log* in the *AQDBMS User's Guide* (ARS, 1997) for detailed instructions.

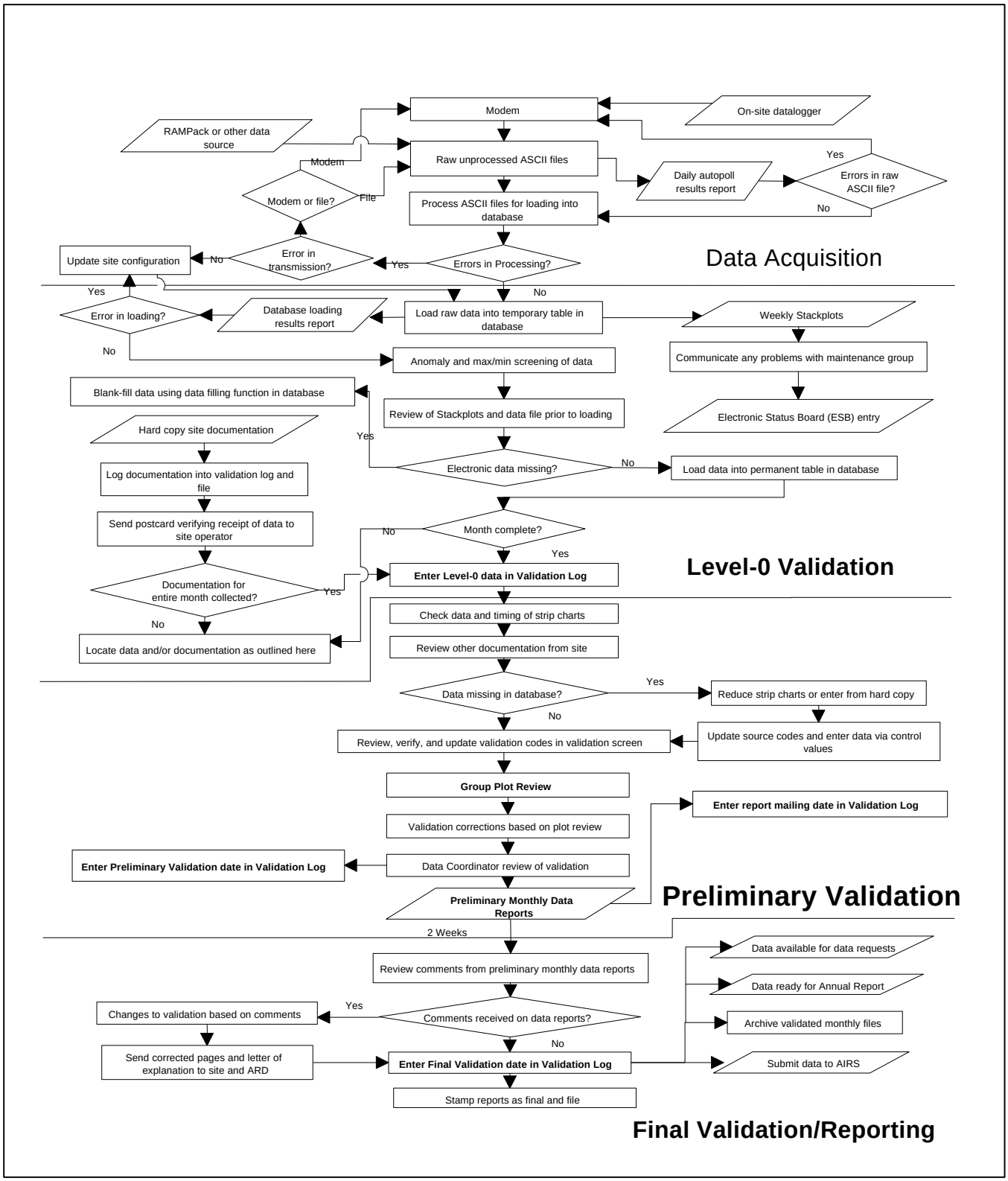


Figure 4-1. NPS Ambient Air Quality and Meteorological Monitoring Network Data Collection, Validation, and Reporting Flow Diagram.

Validation Checklist - Preliminary

Month/Year_____ **Site_____**

		Date	**Initials**
1.	Checked data and timing of strip chart(s).	_____	_____
2.	Checked Daily Summaries (all collected).	_____	_____
3.	Hand Entered/Reduced Data? Y ___ N ___	_____	_____
	Dates and Hours: _____		
4.	Reviewed Previous Commented Stackplots	_____	_____
5.	Checked Power Failure Log. (>15 minutes in any monitoring hour)	_____	_____
6.	Reviewed Control Charts (Diagnostic Plots).	_____	_____
7.	Reviewed Field Station Logs.	_____	_____
8.	Reviewed Station Check Lists.	_____	_____
9.	Check station temperature to be 19.5N C # STP # 30.5N C (API analyzers: 4.5NC # STP # 40.5N C)	_____	_____
10.	Checked Site Status Log.	_____	_____
11.	Reviewed Maximum O_3 and SO_2 forms.	_____	_____
12.	Recorded comments on plots.	_____	_____
13.	Entered validation codes/values into data base.	_____	_____
14.	Entered multipoint calibration data into database (multipoint calibrations conducted by site operator)	_____	_____
15.	Verified that any pre-maintenance calibrations (considered ARS Audit) and other audits are received and entered.	_____	_____
16.	Validation Log updated.	_____	_____
17.	Group Plot Review	_____	_____

Figure 4-2. Preliminary Validation Checklist.

4.3 VALIDATION ACCEPTANCE CRITERIA

Validation acceptance criteria and the methods for determining if a data value meets the criteria are usually related to one of the following events or limitations:

- Data are out of instrument specifications.
- Data exceed minimum or maximum expected value.
- Data exceed minimum or maximum expected rate of change.
- Station temperature is out of specified limits.
- Data are affected by calibration check.
- Zero and span check data are within specified limits.
- Less than 45 minutes of data are available (hourly averaging period).
- Instrument or datalogger was affected by acts of nature.
- Instrument or datalogger was affected by power failure.
- Data capture was affected by a datalogger failure.
- Data were affected by operator maintenance or calibration checks.
- Data were affected by site operator error.
- Data were affected by instrument malfunction or failure.

In order to determine if a data value meets validation acceptance criteria, the data analyst reviews the site documentation and weekly stack plots for the site/month being validated then writes any comments on the plots that affect validation. Comments on plots are based on information from the site documentation, communication with field personnel and site operators, datalogger flags and anomaly screening flags. A commented plot is shown in Figure 4-3. The following guidelines are used when commenting plots:

- Comments are written within the outline of the day of the affected data and in close proximity to the data point affected.
- Comments include the hours affected, the reason(s) for invalidating the data, and the corresponding invalid code.
- Explanations of valid but unusual data are also included.

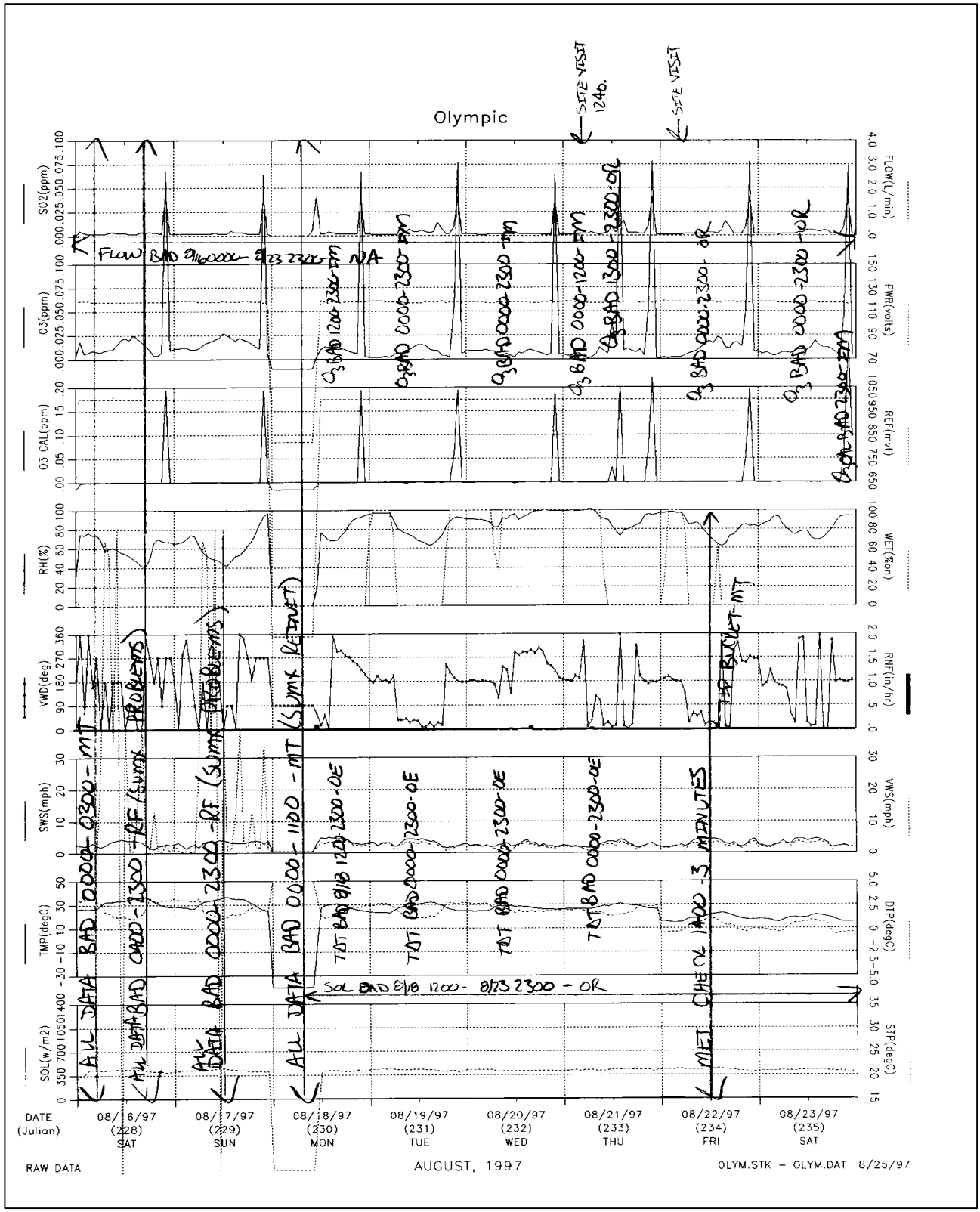


Figure 4-3. Example Commented Stackplot.

- Data points flagged by the anomaly-screening program are noted on the Stackplot when appropriate.

- Site visits are identified at the top of the plot above the corresponding date with date, time, and duration of the visit.

- Normal actions that occur during a site visit and do not invalidate data are also identified on the plot (for example, meteorological instrument checks that last less than 15 minutes). This indicates that a required maintenance check was completed and further establishes validity of the data.

Precision check, calibration, and audit data are reviewed and entered if necessary during this step in the preliminary validation process.

After commenting the weekly Stackplots for a site/month, the AQDBMS Data Validation Log is updated by entering the date Stackplot comments are completed with the analyst's initials into the log record for the site/month.

4.4 ENTERING VALIDATION CODES AND OTHER VALUES INTO THE AQDBMS DATABASE

After commenting Stackplots, validation codes are entered into the database. The codes entered come directly from the commented Stackplots and are also guided by the datalogger and anomaly flags that are already in the database. A validation code is entered for each data point and replaces any datalogger and anomaly screening flags, although sometimes an anomaly screening flag is also a validation code. Table 4-1 is a list of datalogger and anomaly screening flags and most common analyst actions taken based on the flags. Table 4-2 is a list of validation codes and definitions. Figure 4-4 shows the Data Validation Screen in the "Val Code" view.

To enter validation codes:

- Select **Monthly Validation** from the "Validation" menu.

- Enter the **month** to get (1 through 12) in the dialog box.

- Enter the **year** to get (in yyyy format) in the dialog box. An empty validation screen is displayed.

- Click the **arrow** in the "Retrieve Site" box and select the site to retrieve

- Click the **arrow** in the "Par Code" box and select a parameter code.

- Enter the validation codes in the appropriate cells using the dates listed on the left side and the hours listed at the top of the columns as guides.

Table 4-1

Analyst's Actions based on Datalogger and Anomaly Screening Flags

Flag	Type	Description	Action
-	Data logger	Low alarm.	Investigate
#	Data logger	Insufficient data.	Investigate
*	Data logger	Out of calibration.	Investigate
/	Data logger	Rate-of-change alarm .	Investigate
\	Data logger	Rate-of-change alarm.	Investigate
^	Data logger	High alarm.	Investigate
_	Data logger	Low alarm.	Investigate
<	Data logger	Missing data.	None
B	Data logger	Bad input status.	Investigate
C	Data logger	Calibration.	Invalidate with ZS, PC, CA, SC, PA, or MT
D	Data logger	Parameter marked down.	Investigate; can be valid or invalid
F	Data logger	Power failure.	Investigate; might be erroneous or true power failure
P	Data logger	Purge.	Investigate
Z	Data logger	Zero/span.	Investigate
DT	Screening	Dewpoint more than 2.5 degrees C greater than temperature.	Invalidate either TMP or DDT with IM
IM	Screening	Set in VWS, VWD, and SDWD when SWS < min. expected (NV)	Invalidate keeping IM
NR	Screening	Rate of change less than minimum value in the screening ranges table.	Investigate
NV	Screening	Less than minimum value in the screening ranges table.	Investigate
TH	Screening	Data invalid for ozone when station temp is > 30.5 deg C.	Invalidate O3, O3CAL, SO2 keeping TH
TL	Screening	Data invalid for ozone when station temperature < 19.5 degrees C.	Invalidate O3, O3CAL, SO2 keeping TL
VM	Screening	Valid but the validated value has been adjusted for the max value by the screening program based on the max_adj, max_adj_to, and max_val fields of the screening ranges table	None
VZ	Screening	Valid but the validated value has been adjusted for zero by the screening program based on the zero adjustment value in the screening ranges table	None
WS	Screening	Vector wind speed greater than Scalar wind speed – generated by the screening program	Invalidate VWS, VWD, SDWD with RF
XR	Screening program	Rate of change greater than the maximum value in the screening ranges table.	Investigate
XV	Screening program	Greater than the maximum value in the screening ranges table.	Investigate

Table 4-2

Validation Codes

Code	Description
BM	Begin monitoring. For a new site or instrument, place in only one hour before valid data.
CA	Multipoint calibration of an AQ instrument, > 15 min.
EM	End monitoring.
IM	Instrument malfunction. Problem was not discovered until after data had been collected, instrument failure or other problem was not identified until the data validation occurred, may or may not be related to a problem listed on the status board..
IN	Acts of nature.
IW	Instrument warmup. After the instrument was off or a power failure long enough to cause the instrument to go through a warm-up cycle. Some indicators: dpt > temp, noisy signal or drift shown on chart. Usually only used for 1-2 hours
LI	Local interference. Human interference directly or indirectly that was local and not under the control of the operator. Examples: dust, particulates, construction.
MT	Maintenance. Someone on-site actively attempting repairs or doing preventive maintenance (changing chart paper, replacing instrument parts). Can be the site operator or repair person or remote activation or programming of the data logger.
NA	Monitoring out for the month, before or after an analyzer is placed at a site, no intent of collecting data, unable to calculate value (for example RH).
OE	Mistake by operator or anybody else at the station that leads to a loss in data. Ex.: switches left in incorrect positions after repairs or calibrations, lines not returned to the manifold after an audit, open manifold ports, etc.
OR	Instrument in process of being repaired, often off-site. Incapable of getting good values, more than 1-hour of data, problem identified on site & status log or log book record would normally be present. MT must follow. Often a cal must follow.
OS	Signal is off the top of the chart, data is presumed good.
PA	Calibration on-site by an external agency person. May be several hours.
PC	Precision Check. Normally once per week, not more than 1 per day (all others should be listed as ZS or MT).
PF	Power failure >= 15 minutes, instrument warm-up and data loss at the top of the hour may also be an issue (RF).
RF	Data logger system fails and chart record is unavailable.
SA	External agency person on-site which leads to data loss (not used much).
SC	Use when both a precision check and a zero/span check are done within the same hour. Not to be used with a PC in the same day.
TH	Data invalid for ozone when station temp is > 30.5 deg C.
TL	Data invalid for ozone when station temperature < 19.5 degrees C.
TO	When time is off by more than 5 minutes.
V	Valid Value.
VA	Valid value, but the validated value has been adjusted from the raw value by the data analyst. The control value field must contain the offset.
VM	Valid but the validated value has been adjusted for the max value by the screening program based on the max_adj, max_adj_to, and max_val fields of the screening ranges table
VZ	Valid but the validated value has been adjusted for zero by the screening program based on the zero adjustment value in the screening ranges table
ZS	Invalid data for the hour if zero/span takes longer than 15 minutes or the hour

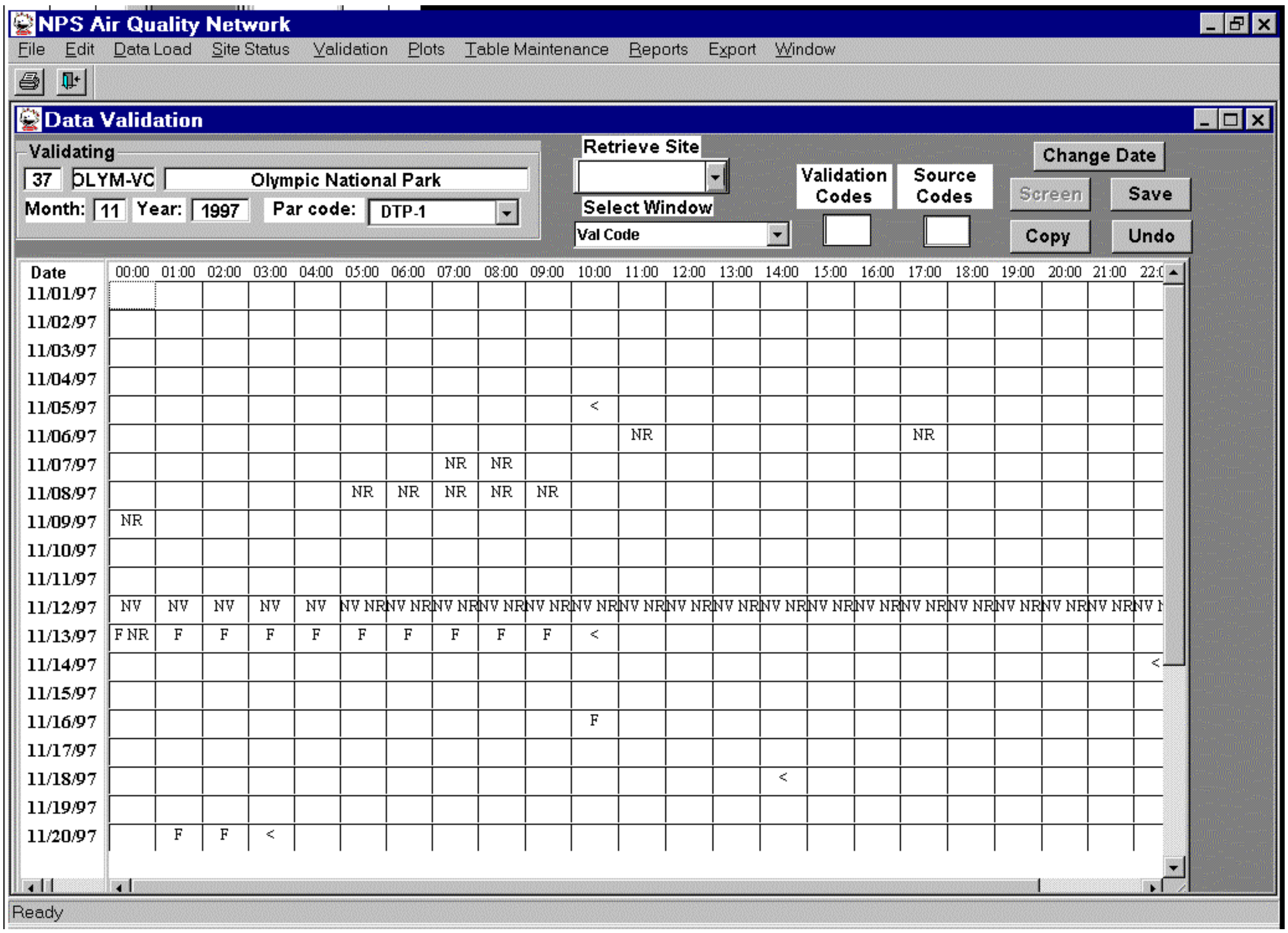


Figure 4-4. Example Data Validation Screen in the Val Code View.

At times, raw data may need to be adjusted in order to get a correct, validated value. A situation may occur where a data point is valid, but the datalogger was scaled or initialized incorrectly. In cases when the data can be appropriately adjusted, a control value is entered in the control value field that operates on the raw value to provide an adjusted validated value. For example, if the data analyst determines the datalogger was programmed with incorrect units for a parameter, the data is not invalid but it is incorrect.

A multiplier placed in the control value field is used to properly convert the data. Control values are entered in the Val Code/Raw/Ctrl/Val Val data view as shown in Figure 4-5. Usually, control values are offset values that are applied to raw values and result in validated values that equal the raw value plus or minus the offset. The first character in the control value field must be an operator. For example, if you determine that the raw data values for wind speed are 10 mph less than they truly were, enter "+10" in each control value field. When the control value field is used, the final data validation code must equal "VA" for valid, adjusted.

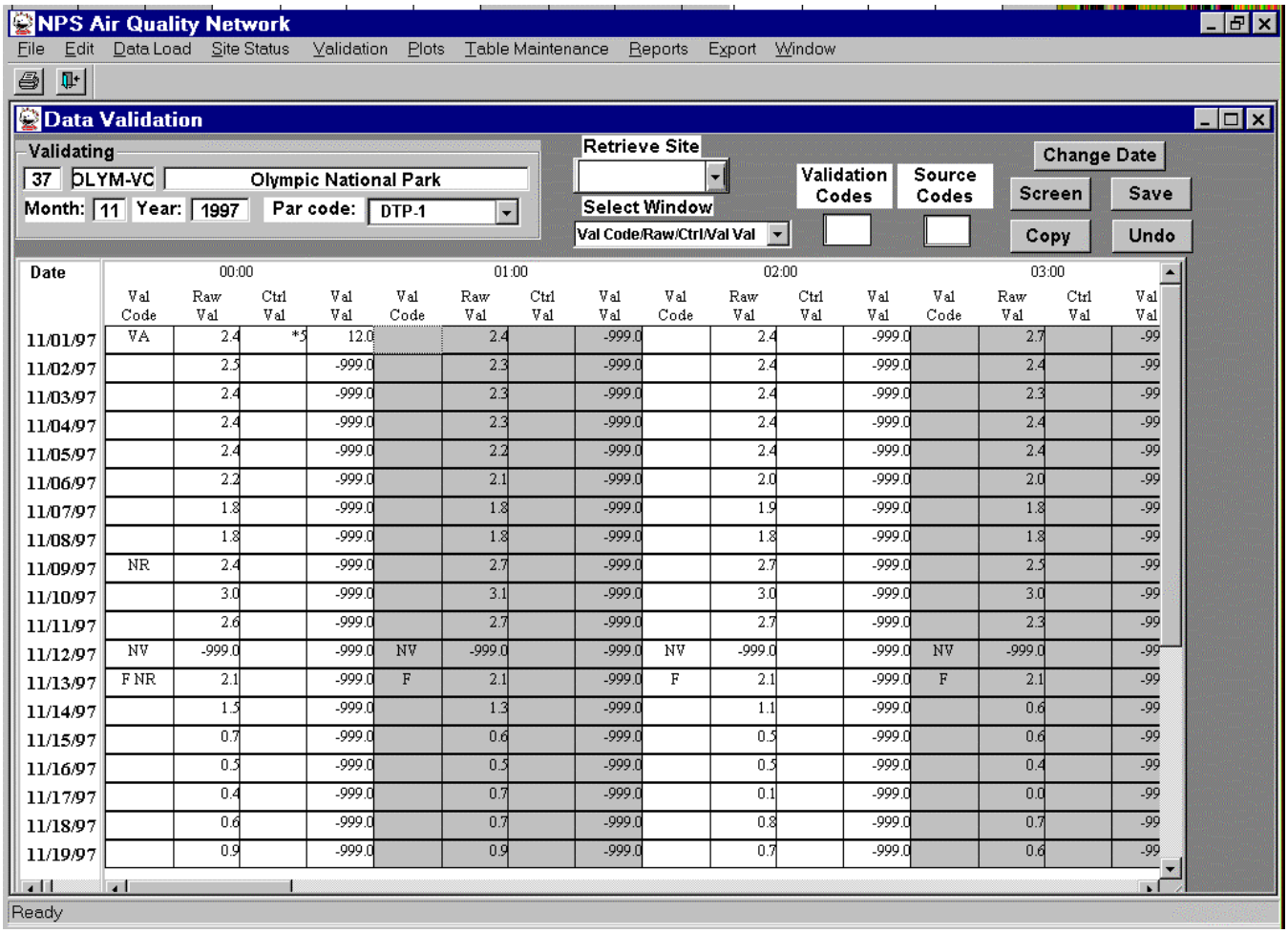
Acceptable operators for control values are:

Operator	Result
+	adds the control value to the raw value
-	subtracts the control value from the raw value
*	multiplies the raw value by the control value
/	divides the raw value by the control value
=	substitutes the control value for the raw value

To enter control values:

- Click the **down arrow** in the "Select View" box and select **Val Code/Raw/Ctrl Val/Val Val.**
- Click in the control value cell of the affected site, parameter code, date and time and type one of the acceptable operators.
- Type the value to be applied.
- Click in the next cell or press the **TAB** key to move one to the next control value field.

See *Section 3.0 The Monthly Validation Window* in the *AQDBM User's Guide* (ARS, 1997) for detailed operating instructions for entering validation codes and other values.



Date	00:00				01:00				02:00				03:00			
	Val Code	Raw Val	Ctrl Val	Val Val	Val Code	Raw Val	Ctrl Val	Val Val	Val Code	Raw Val	Ctrl Val	Val Val	Val Code	Raw Val	Ctrl Val	Val Val
11/01/97	VA	2.4	*5	12.0		2.4		-999.0		2.4		-999.0		2.7		-99
11/02/97		2.5		-999.0		2.3		-999.0		2.4		-999.0		2.4		-99
11/03/97		2.4		-999.0		2.3		-999.0		2.4		-999.0		2.3		-99
11/04/97		2.4		-999.0		2.3		-999.0		2.4		-999.0		2.4		-99
11/05/97		2.4		-999.0		2.2		-999.0		2.4		-999.0		2.4		-99
11/06/97		2.2		-999.0		2.1		-999.0		2.0		-999.0		2.0		-99
11/07/97		1.8		-999.0		1.8		-999.0		1.9		-999.0		1.8		-99
11/08/97		1.8		-999.0		1.8		-999.0		1.8		-999.0		1.8		-99
11/09/97	NR	2.4		-999.0		2.7		-999.0		2.7		-999.0		2.5		-99
11/10/97		3.0		-999.0		3.1		-999.0		3.0		-999.0		3.0		-99
11/11/97		2.6		-999.0		2.7		-999.0		2.7		-999.0		2.3		-99
11/12/97	NV	-999.0		-999.0	NV	-999.0		-999.0	NV	-999.0		-999.0	NV	-999.0		-99
11/13/97	F NR	2.1		-999.0	F	2.1		-999.0	F	2.1		-999.0	F	2.1		-99
11/14/97		1.5		-999.0		1.3		-999.0		1.1		-999.0		0.6		-99
11/15/97		0.7		-999.0		0.6		-999.0		0.5		-999.0		0.6		-99
11/16/97		0.5		-999.0		0.5		-999.0		0.5		-999.0		0.4		-99
11/17/97		0.4		-999.0		0.7		-999.0		0.1		-999.0		0.0		-99
11/18/97		0.6		-999.0		0.7		-999.0		0.8		-999.0		0.7		-99
11/19/97		0.9		-999.0		0.9		-999.0		0.7		-999.0		0.6		-99

Figure 4-5. Example Data Validation Screen in the Val Code/Raw/Ctrl/Val Val View.

4.5 REVIEWING VALIDATED DATA STACKPLOTS AND OTHER OUTPUT

Additional tools for verifying complete and accurate entry of validation codes are available within the AQDBMS. The data analyst completes the following checks:

- Reviews the Data Collection Statistics table for a site/month, to quickly detect if a code was missed for parameters that must be validated identically and to look for indications missed power failures or recorder failures.

- Reviews High Values Tables for individual pollutant parameters to detect calibration points inadvertently left in as valid.

- Reviews validated data Stackplots to further verify that no points were missed.

All of these products can be reviewed either on screen or as printed copy. See TI ____-____, Generating Report Tables from the AQDBMS for detailed instructions.

Preliminary data validation is complete after entering validation codes for a site/month and reviewing the validated data output. The AQDBMS Data Validation Log is then updated by entering the date completed and the analyst's initials into the log record for the site/month.

5.0 REFERENCES

Air Resource Specialists, Inc. (ARS), 1997, AQDBMS User's Guide.

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QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
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1.0 PURPOSE AND APPLICABILITY

This technical instruction (TI) describes the steps taken by the National Park Service (NPS) Air Resources Division's (ARD) Information Management Center (IMC) for completing final validation of ambient air quality and meteorological data. These steps apply to all ambient air quality and meteorological parameters that are monitored and loaded into the Air Quality Database Management System (AQDBMS), regardless of whether the data for a specific parameter is uploaded to the EPA AIRS database. This TI is referenced from SOP 3450, *Collection of Air Quality and Meteorological Data*, and SOP 3450, *Ambient Air Quality and Meteorological Data Validation*.

This TI presents the detailed steps used to ensure high quality preliminary data validation of ambient air quality and meteorological data. Data for a site/month must be at preliminary validation before beginning final validation. The Final Validation Checklist is used as a guide for the final validation procedure. The checklist identifies the major steps taken during final validation and provides a record of the date each step was completed and the initials of the analyst completing it. Final data validation is accomplished by the following:

- A group plot review that includes input from air quality specialists, field specialists, and site operators to resolve all questionable validation issues.
- Making necessary validation code changes in the AQDBMS based on the group plot review discussion.
- Generating and reviewing monthly data reports.

Occasionally, validation errors will be detected after final validation has been completed and post-final validation steps are taken to record the corrections.

2.0 RESPONSIBILITIES

2.1 DATA COORDINATOR

The data coordinator shall:

- Correct data based on site operator comments.
- Update the Data Validation Log in the AQDBMS with the final validation date.
- File reports when final.

2.2 SITE OPERATOR

The site operator shall:

- Review monthly reports.
- Respond to the IMC with comments if necessary.

2.3 TECHNICAL ASSISTANT

The technical assistant shall mail any corrections made to reports to the NPS ARD and site operators.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 THE AIR QUALITY DATABASE MANAGEMENT SYSTEM (AQDBMS)

The Air Quality Database Management System (AQDBMS) is the primary tool used to validate ambient air quality and meteorological data. The Air Quality Database Management System (AQDBMS) is comprised of two main components:

- An Oracle database specifically designed and developed by Air Resource Specialists (ARS) to hold air quality network data and to accommodate the many temporal, spatial, and functional variations found within an air quality network.

- Customized software programs developed by Air Resource Specialists that provide an interface to the Oracle database.

3.1.1 System Hardware Requirements

The AQDBMS requires the following hardware:

- Workstations - Networked Intel Pentium-based workstations with at least 16MB of RAM (32MB recommended), 1024 x 768 resolution (recommended large fonts, 17 inch or larger monitor), 40MB of available hard disk space, and a mouse.

- Database Server - An Intel Pentium-based database server with hard disks providing at least 2 gigabytes of storage and at least 48MB of RAM, color monitor, mouse, CD-ROM, and back-up device.

3.1.2 System Software Requirements

The AQDBMS requires the following commercial software:

- PC operating system - Microsoft Windows95.

- Network operating system - Novell Netware 3.12 or 4.11; IPX protocol.

- Database engine - The Oracle 7 (version 7.2 or 7.3) Workgroup Server for Netware Relational Database Management System (RDBMS).

- Database connectivity - Oracle SQL*Net (version 2.2 or 2.3) IPX protocol adapter. Oracle ODBC Driver for Oracle version 2.05 or later.

- User interface - Powersoft PowerBuilder version 5.0.02 run-time libraries. Microsoft VisualBasic version 5.0 run-time libraries.

The AQDBMS requires the following ARS-developed software:

- User interface for loading, screening, validation, reporting, creation of AIRS files, etc. – PowerBuilder executables (ESD.exe and .PBD files). VisualBasic executables (vbrose32.exe, diur32.exe, vbbar32.exe, stkwin.exe vbsum32.exe).

4.0 METHODS

Data for a site/month must be at preliminary validation before beginning final validation (see Figure 4-1). The Final Validation Checklist, shown in Figure 4-2, is used as a guide for the final validation procedure. The checklist identifies the major steps taken during final validation and provides a record of the date each step was completed and the initials of the analyst completing it. This section discusses the methods used to complete final data validation of air quality and meteorological data. This section contains the following five (5) subsections:

4.1 The Data Validation Log
4.2 The Site Status Log
4.3 Group Plot Review
4.4 Making Validation Code Corrections and Completing Final Validation
4.5 Post-Final Validation Procedures

4.1 THE DATA VALIDATION LOG

The Data Validation Log is used to track the completion of each major step of the validation process. The master record logs the initials of the data technician completing each validation step and when it occurred. The detail table logs the receipt of the various supporting documents received from the field specialist and/or site operator. The log entry for a particular site/month must exist before data can be edited in the Data Validation Window. See *Section 4.0 Using the Data Validation Log* in the *AQDBMS User's Guide* (ARS, 1997) for detailed instructions.

4.2 THE SITE STATUS LOG

The Site Status Log is a diary of site-related events such as instrument malfunctions and repairs, data adjustments, calibrations, special site visits, weather episodes, etc. that may be relevant to data validation. A basic description of each event is entered as a record in the master table. The master record contains the site number and name, a reference number assigned by the program, date started and stopped fields to define the period of time involved and an affected parameters field to indicate which data parameters may be affected by the event. There is also a field to indicate if the event is considered to be a problem or not. This field is used to quickly create a list of current problems found in the log. The detail table holds as many records as needed to record notes about each event. Normally, a master record will have at least one detail record. Entries can be added, modified, or deleted in both the master and the detail tables. See *Section 5.0 Using the Site Status Log* in the *AQDBMS User's Guide* (ARS, 1997) for detailed instructions.

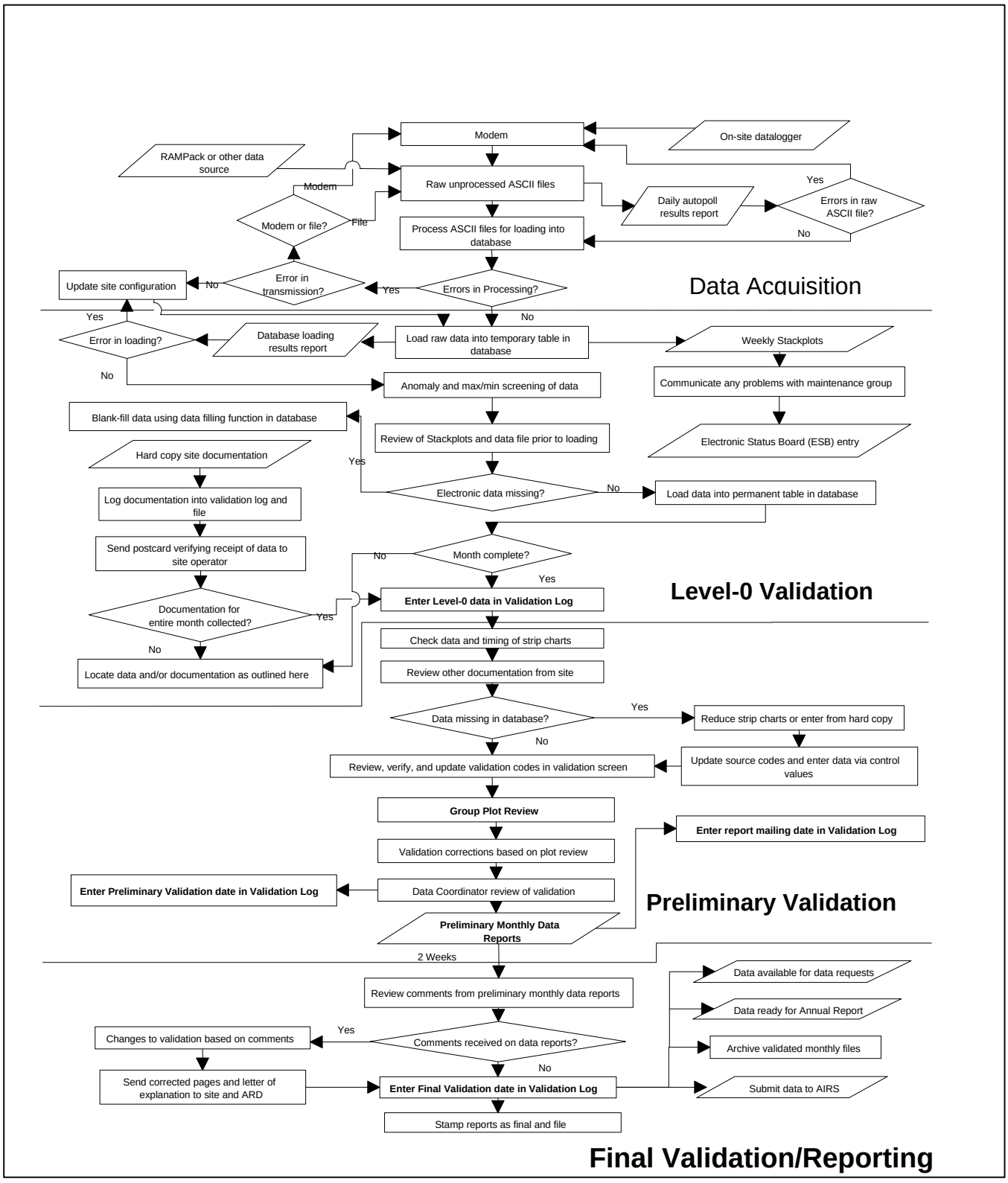

Figure 4-1. NPS Ambient Air Quality and Meteorological Monitoring Network Data Collection, Validation, and Reporting Flow Diagram.

Validation Checklist - Final

Month/Year_____ **Site_____**

Date of Validation_____ **Initials_____**

		Date	**Initials**
1.	Checked Preliminary Validation Checklist.	_____	_____
2.	Review plots with comments	_____	_____
3.	Verify preliminary edits.	_____	_____
4.	Verify preliminary invalid data codes.	_____	_____
5.	Run validated data plots for monthly report.	_____	_____
6.	Data Validation Log updated.	_____	_____
7.	Comments:_____		
	_____		
	_____		
	_____		
	_____		
8.	Review comments from Monthly Report	_____	_____
9.	Data Validation Log updated.	_____	_____
10.	Create updated plots.	_____	_____

Figure 4-2. Final Validation Checklist.

4.3 GROUP PLOT REVIEW

A plot review is held to review all data collected for a month. Included in the group are data analysts, field specialists, and NPS personnel affiliated with the project. All plots are reviewed, questions asked, maintenance issues discussed, and questionable validation situations resolved. Any unresolved issues are identified and resolved within a few days after the plot review. Problem resolutions are explained at the next plot review.

4.4 COMPLETING FINAL VALIDATION

After the plot review and after problems have been resolved, necessary validation code changes are made in the database.

To make validation code changes:

- Select **Monthly Validation** from the "Validation" menu.
- Enter the **month** to get (1 through 12) in the dialog box.
- Enter the **year** to get (in yyyy format) in the dialog box. An empty validation screen is displayed.
- Click the **arrow** in the "Retrieve Site" box and select the site to retrieve.
- Click the **arrow** in the "Par Code" box and select a parameter code.
- Replace the affected validation codes in the appropriate cells using the dates listed on the left side and the hours listed at the top of the columns as guides.

After making validation code changes, the following steps are taken to complete final validation:

- The changed data are regenerated into a new stack plot data file to replace the old.
- Monthly reports are generated.
- The data analysts and technicians review the reports for any missed data validation points.
- Monthly report pages affected by the changes are regenerated.
- Reports are mailed; one copy to NPS ARD and one copy to the site operator. One copy remains in the file in the IMC.
- Recipients of the reports are given two weeks to review the reports and submit comments on the reports.

- If no comments have been received in within two weeks of mailing the report, the final validation is complete. If comments are received requiring additional validation code changes, the changes are made, monthly report pages affected by the change are regenerated and mailed to the report recipients.

- The monthly data reports are stamped with the final validation stamp in the upper right hand corner of the cover page and filed.

- The Data Validation Log entry for the site/month is updated with the Final Validation date and initials of the responsible analyst.

After completing these steps, final validation is complete and data can be uploaded to AIRS and included in data requests.

4.5 POST-FINAL VALIDATION PROCEDURES

If a validation error is found after the data are labeled as final, the following steps are taken:

- The final validation date in the validation log for the site/month is deleted.

- The necessary changes are made in the AQDBMS database.

- A detailed log record explaining the changes made is added to the Data Validation Log for the site/month.

- A new final validation date is entered in the Data Validation Log for the site/month.

- The changes are explained in the comments section of the final validation checklist for the site/month.

- The monthly report pages that were affected by the change are regenerated and replaced in the report on file. A copy of each changed page is also sent to the recipients of the monthly report with a cover letter explaining the changes and the need to replace the page(s) in their copy of the report.

- A note with the date and analyst's initials is attached to the cover of the monthly data report explaining the changes made.

- If the affected data have been submitted to the EPA-AIRS Database, they must be resubmitted

5.0 REFERENCES

Air Resource Specialists, Inc. (ARS), 1997, AQDBMS User's Guide.

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1.0 PURPOSE AND APPLICABILITY

This standard operating procedure (SOP) outlines the steps of producing ambient air quality and meteorological data reports. Reporting of Ambient Air Quality and Meteorological Monitoring by the National Park Service (NPS) Information Management Center (IMC) includes preparation and distribution of the following report products:

- Monthly progress reports
- Monthly preliminary data reports
- Annual data reports
- Monthly ozone "hit list"; a listing of ozone hourly averages exceeding 100 ppb

In addition, the IMC reports criteria pollutant, meteorological, and precision and accuracy data to the Environmental Protection Agency's AIRS (Aerometric Information Retrieval System) database on a quarterly basis and the IMC handles individual data requests as they are received.

Monthly progress reports summarize the technical aspects of the National Park Service Ambient Air Monitoring Assistance Contract performed during the reported month. These reports include the technical progress of both network operations and information management tasks, along with project-related milestones and maintenance schedules.

Monthly preliminary data reports provide the National Park Service Air Resources Division (NPS ARD) personnel, individual station operators, and other project-related personnel the opportunity to review and comment on preliminary ambient ozone (O_3) and/or sulfur dioxide (SO_2) data and associated meteorological data collected at individual monitoring sites. A separate report is prepared for each monitoring site operating during the reported month.

Annual data summary reports highlight the average range and frequency of data collected a monitoring site during the year. These summaries provide information on the status and trends of air quality conditions and help determine if a site is exceeding the National Ambient Air Quality Standards (NAAQS) established by the U.S. Environmental Protection Agency (EPA).

The monthly ozone "hit list" is a list of ozone hourly averages exceeding 100 ppb indicating the locations and frequency of high ozone values. This list is forwarded to the NPS Air Resources Division (ARD).

The EPA AIRS database is a repository of air quality related data from a multitude of federal, state, and city agencies. Data from the NPS Ambient Air Quality Network are submitted to allow retrieval of the data by other government agencies and researchers from a common source.

Data requests are handled on an individual basis. Each request is authorized by the ARD before being filled by the IMC. Although data requests vary, a standard procedure has been developed for handling them.

This standard operating procedure (SOP) outlines the processes of reporting data. For detailed instructions on data reporting refer to the following technical instructions:

- TI 3550-5000, *Ambient Air Quality and Meteorological Data Monthly Reporting*
- TI 3550-5100, *Ambient Air Quality and Meteorological Data Annual Reporting*
- TI 3550-5200, *Handling Ambient Air Quality and Meteorological Data Requests*
- TI 3550-5300, *Submitting Ambient Air Quality and Meteorological Data to the EPA AIRS Database*

2.0 RESPONSIBILITIES

2.1 DATA COORDINATOR

The data coordinator shall:

- Verify that preliminary data validation has been successfully completed for monthly reported data.
- Prepare the report tables and plots for monthly reports that correctly reflect the validated data.
- Generate the Validation Progress Report Table for the monthly progress report and verify that it is correct.
- Summarize and forward items discussed in the monthly plot review to the technical assistant for inclusion in the monthly progress report.
- Prepare and forward the monthly ozone “hit” list to the NPS ARD.
- Verify that final data validation has been successfully completed for annual reported data.
- Prepare the report tables and plots for annual reports that correctly reflect the validated data.
- Submit data to the EPA AIRS database.
- Handle all data requests.

2.2 DATA ANALYST AND DATA TECHNICIAN

The data analyst and data technician shall assist the data coordinator with the preparation, review, and correction of reports.

2.3 TECHNICAL ASSISTANT

The technical assistant shall:

- Assemble and organize the information for the monthly progress report.
- Word process the text portions of the monthly, preliminary, and annual data reports.
- Generate the maps and site specification pages for each annual data report.
- Copy and mail the reports to each recipient.
- Prepare accompanying cover letters for data requests.

3.0 REQUIRED EQUIPMENT AND MATERIALS

Microsoft Word for Windows 97 is used to word process the text portions of reports. Data report tables, plots, AIRS transaction files, and data request files are generated by programs in the Air Quality Database Management System (AQDBMS).

Submitting data to the EPA AIRS database requires:

- A telephone modem.
- Communications software.
- An Internet connection service provider.
- FTP (file transfer protocol) software.

3.1 THE AIR QUALITY DATABASE MANAGEMENT SYSTEM (AQDBMS)

The Air Quality Database Management System (AQDBMS) is the primary tool used to validate ambient air quality and meteorological data. The Air Quality Database Management System (AQDBMS) is comprised of two main components:

- An Oracle database specifically designed and developed by Air Resource Specialists (ARS) to hold air quality network data and to accommodate the many temporal, spatial, and functional variations found within an air quality network.
- Customized software programs developed by Air Resource Specialists that provide an interface to the Oracle database.

3.1.1 System Hardware Requirements

The AQDBMS requires the following hardware:

- Workstations - Networked Intel Pentium-based workstations with at least 16MB of RAM (32MB recommended), 1024 x 768 resolution (recommended large fonts, 17 inch or larger monitor), 40MB of available hard disk space, and a mouse.

- Database Server - An Intel Pentium-based database server with hard disks providing at least 2 gigabytes of storage and at least 48MB of RAM, color monitor, mouse, CD-ROM, and back-up device.

- Reporting - High-resolution laserjet or inkjet printer for printing.

3.1.2 System Software Requirements

The AQDBMS requires the following commercial software:

- PC operating system - Microsoft Windows95.

- Network operating system - Novell Netware 3.12 or 4.11; IPX protocol.
- Database engine - The Oracle 7 (version 7.2 or 7.3) Workgroup Server for Netware Relational Database Management System (RDBMS).

- Database connectivity - Oracle SQL*Net (version 2.2 or 2.3) IPX protocol adapter. Oracle ODBC Driver for Oracle version 2.05 or later.

- User interface - Powersoft PowerBuilder version 5.0.02 run-time libraries. Microsoft VisualBasic version 5.0 run-time libraries.

The AQDBMS requires the following ARS-developed software:

- User interface for loading, screening, validation, reporting, creation of AIRS files, etc. – PowerBuilder executables (ESD.exe and .PBD files). VisualBasic executables (vbrose32.exe, diur32.exe, vbbar32.exe, stkwin.exe vbsum32.exe).

4.0 METHODS

One monthly progress report for the network is generated each month. Separate monthly and annual reports are produced for each site collecting data during the monitoring period. In addition, annual reports are generated for selected NPS sites that are not part of the NPS Ambient Air Quality Monitoring Program Network. At these sites, data were collected, validated, and submitted to the EPA AIRS database by another agency. The data are downloaded from AIRS and are loaded in to the AQDBMS database.

The ozone "hit" list is generated from raw data in the AQDBMS database. Data requests are typically filled from finalized data in the AQDBMS database. Final data are submitted to the EPA AIRS database on at least a quarterly basis.

This section includes seven (7) main subsections:

4.1 Monthly Progress Report
4.2 Monthly Data Report
4.3 Annual Data Report
4.4 Ozone Hit List
4.5 Data Requests
4.6 Distribution
4.7 Submitting Data to the EPA AIRS Database

4.1 MONTHLY PROGRESS REPORT

Monthly progress reports summarize the progress of network-related tasks during the report month. This report is completed and distributed by the 10th of the month following the reported month. Specific content of the progress report varies from month to month, however, each report generally includes the following:

- An introduction including current monitoring site map.
- Task progress updates, milestones, and site visits relating to operational monitoring support.
- Task progress updates, milestones, and ARS/NPS team meetings relating to data collection and validation.
- Contract administration items.

4.2 MONTHLY DATA REPORT

Monthly data reporting involves generating a preliminary data report for each site in the NPS Ambient Air Quality Monitoring Program Network where data were collected during the reported period. Monthly preliminary reports are completed and distributed within 60 days after the end of the reported month as the culmination of data validation (see Figure 4-1). Each preliminary data report contains the following sections and products:

- Introduction
- Data Summaries and Statistics
- Data Collection Statistics Table
- Stackplots for all parameters, one plot for each 7 or 8 days
- Meteorological Parameter Summary Table
- Wind Rose Plot

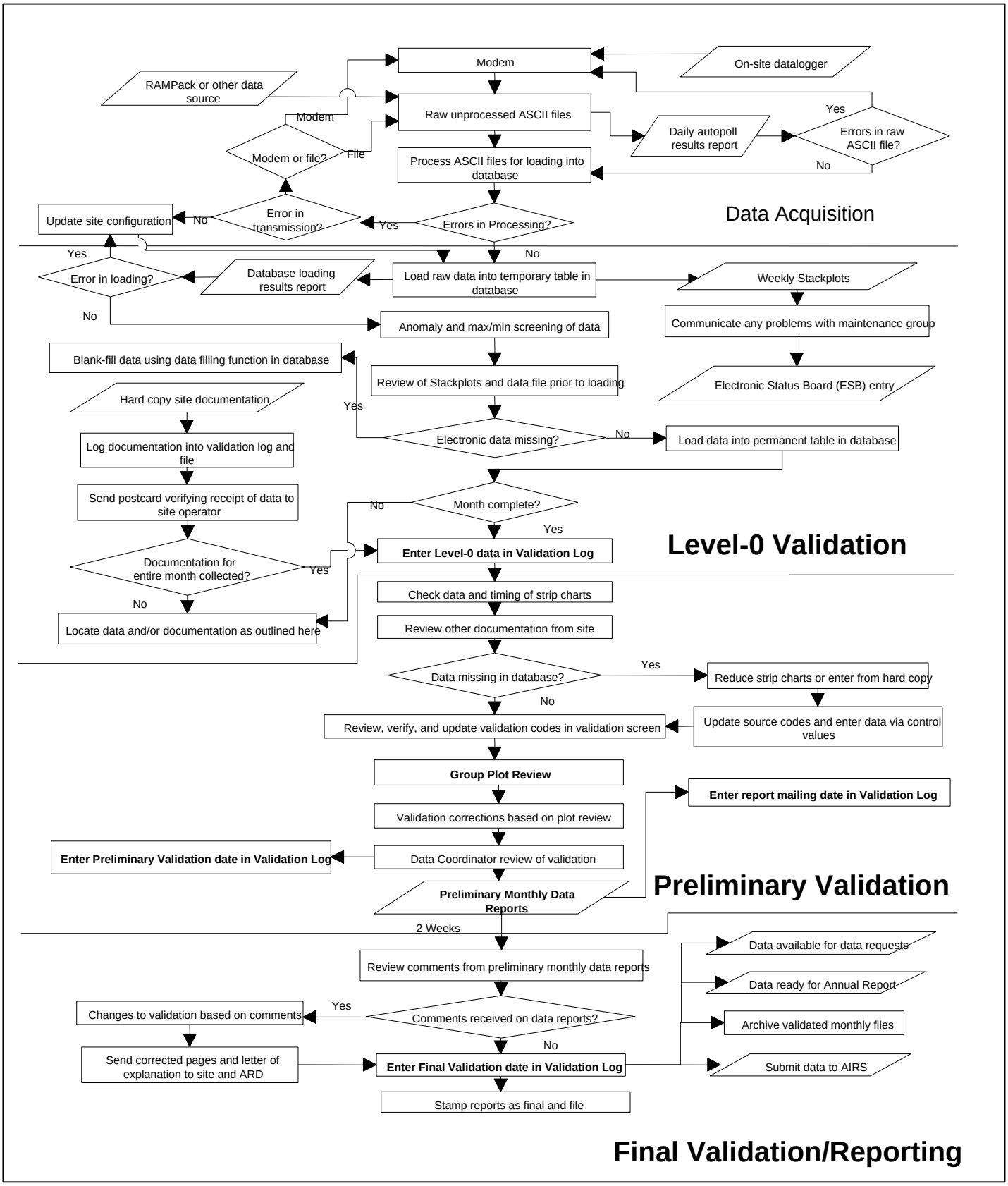

Figure 4-1. NPS Ambient Air Quality and Meteorological Monitoring Network Data Collection, Validation, and Reporting Flow Diagram

At each site where ozone is monitored, the preliminary data report includes these products:

- Ozone Values Versus National Ambient Air Quality Standards (NAAQS) Table (Ten Highest Daily 1-Hour Average Ozone Concentrations)
- Diurnal Ozone Plot
- Ozone Pollutant Rose Plot
- Ozone Hourly Average Table

At each site where sulfur dioxide is monitored, the preliminary data report includes these products:

- Sulfur Dioxide Values Versus National Ambient Air Quality Standards (NAAQS) Table (Five Highest Daily 1-Hour Average, Five Highest 3-Hour Block Average, and Five Highest 24-Hour Average Sulfur Dioxide Concentrations)
- Diurnal Sulfur Dioxide Plot
- Sulfur Dioxide Pollutant Rose
- Sulfur Dioxide Hourly Average Table

At each site where supplemental sulfur dioxide is monitored, the preliminary data report includes these products:

- Supplemental Sulfur Dioxide Values Versus National Ambient Air Quality Standards (NAAQS) Table (Five Highest Daily 1-Hour Average, Five Highest 3-Hour Block Average, and Five Highest 24-Hour Average Sulfur Dioxide Concentrations)
- Diurnal Supplemental Sulfur Dioxide Plot
- Sulfur Supplemental Dioxide Pollutant Rose
- Sulfur Supplemental Dioxide Hourly Average Table

The steps taken to produce each monthly preliminary data report are:

- Verify completion of preliminary data validation of the reported data.
- Print report tables.
- Create Stackplot data files.
- Print report plots.

- Print the cover page and text pages.
- Print review checklists.
- Review reports.
- Make corrections.
- Copy and mail reports, file original.
- Replace pages affected by changes resulting from comments.
- Stamp original report “final”.

Refer to TI 3550-5000, *Ambient Air Quality and Meteorological Data Monthly Reporting*, for details on each step.

4.3 ANNUAL DATA REPORT

Annual data reporting involves generating an annual data summary report for each site in the NPS Ambient Air Quality Monitoring Program Network where data were collected during the reported period. Annual data summary reports are completed and distributed by August 31 following the reported year. Each annual data summary report contains the following sections and products:

- Section 1.0 Introduction:
  - A description of the monitoring network including a site map
  - A detailed description of the individual monitoring site including a site specifications map
- Section 2.0 Data Summary:
  - Data Collection Statistics
  - Stackplots of all parameters, one for each quarter year
  - Summary of Selected Meteorological Data
  - Quarterly Wind Rose Plots
  - Annual Wind Rose Plot

  At sites where ozone was monitored during the year, this section also includes:
  - Ozone Precision Check Data Summary
  - Ozone Quick Look Annual Summary Statistics

- Ozone Annual Frequency Distribution
- Ozone Standards Report and Maximum 1-hour Concentrations
- EPA Primary Ozone Standards Attainment Status
- EPA Secondary Ozone Standards Attainment Status
- Ten Highest Daily 1-Hour Average Ozone Concentrations
- Episodes with 1-Hour Ozone Concentrations $\geq$ 100 ppb and > 124 ppb.
- Ozone Rank Listings of Second Highest 1-Hour Average Concentrations, Maximum 8-Hour Average Concentrations, and Annual Sum60 Exposure Index for All NPS Monitoring Sites
- Ozone Three Year Comparison of Second Highest Concentrations
- Quarterly Diurnal Ozone Plots
- Annual Diurnal Ozone Plot
- Quarterly Ozone Pollutant Rose Plots
- Annual Ozone Pollutant Rose Plots

At sites where sulfur dioxide was monitored during the year, this section also includes:

- Sulfur Dioxide Precision Check Data Summary
- Sulfur Dioxide Quick Look Annual Summary Statistics
- Sulfur Dioxide Annual Frequency Distribution
- EPA Primary Sulfur Dioxide Standards Attainment Status
- Five Highest Daily 1-Hour Average, Five Highest 3-Hour Block Average, and Five Highest 24-Hour Average Sulfur Dioxide Concentrations
- Sulfur Dioxide Standards Report and Daily Maximum 1-Hour Concentrations Table
- Sulfur Dioxide Standards Report and Daily Maximum 3-Hour Concentrations Table
- Sulfur Dioxide Standards Report and Daily Maximum 24-Hour Concentrations Table
- Sulfur Dioxide Three Year Comparison of Second Highest Concentrations
- Quarterly Diurnal Sulfur Dioxide Plots
- Annual Diurnal Sulfur Dioxide Plot
- Quarterly Sulfur Dioxide Pollutant Rose Plots
- Annual Sulfur Dioxide Pollutant Rose Plots

At sites where a supplemental sulfur dioxide monitor collected data during the year, this section also includes:

- Supplemental Sulfur Dioxide Precision Check Summary
- Supplemental Sulfur Dioxide Five Highest Daily 1-Hour Averages, 3-Hour Block
- Averages, and 24-Hour Block Averages
- Supplemental Sulfur Dioxide Three Year Comparison of Second Highest Concentrations
- Quarterly Diurnal Supplemental Sulfur Dioxide Plots
- Annual Diurnal Supplemental Sulfur Dioxide Plot
- Quarterly Supplemental Sulfur Dioxide Pollutant Roses
- Annual Supplemental Sulfur Dioxide Pollutant Rose
- Quarterly Supplemental Sulfur Dioxide Pollutant Rose Plots
- Annual Supplemental Sulfur Dioxide Pollutant Rose Plots

- Section 3.0 National Park Service Air Resources Division Data Sources
  - Data Disk Contents
  - NPS IMC and AIRS Invalid Data Codes
  - Other Sources for Retrieving NPS Gaseous Pollutant Data
- Section 4.0 Glossary
  - Definitions and Computational Procedures for NPS Quick Look Annual Summary Statistics Table
  - Air Quality Glossary

The steps taken to produce each annual summary report are:

- Verify completion of final data validation of the reported data.
- Retrieve and load non-network data into the AQDBMS database.
- Print report tables.
- Create Stackplot data files.
- Create monthly columnar data files.
- Print report plots.

- Print the cover page, text, and map pages.
- Print review checklists.
- Review reports.
- Make corrections and update Data Validation Log records.
- Copy and mail reports, file originals.

Refer to TI 3550-5100, *Ambient Air Quality and Meteorological Data Annual Reporting,* for details on each step.

4.4 OZONE HIT LIST

The Ozone Hit List is generated from raw data at the end of every month during the ozone season, which is May through September. Since the data have not yet been validated, the data coordinator reviews the list and excludes values recorded during obvious non-ozone events such as daily zero/span calibrations. Refer to TI 3550-5000, *Ambient Air Quality and Meteorological Data Monthly Reporting,* for details on each step.

4.5 DATA REQUESTS

Data requests are received by the ARD or IMC and forwarded to the IMC data coordinator. The data coordinator takes the following steps:

- Fills out the Data Request Form.
- Determines the amount of time and materials needed to fill the request.
- Forwards the request information to the ARD for authorization.
- Prepares the data files and/or hard copy output required to fill the request.
- Prepares accompanying support documentation and/or correspondence.
- Delivers the request.
- Files the completed Data Request Form with copies of related documentation.

These steps are detailed in TI 3550-5200, *Handling Ambient Air Quality and Meteorological Data Requests*.

4.6 DISTRIBUTION

4.6.1 Distribution of Monthly Progress Reports

One copy of the Monthly Progress Report is delivered to the NPS ARD by the 10th of the month following the reported month. A copy of each report is kept on file in the IMC for one year.

4.6.2 Distribution of Monthly Preliminary Data Reports

The original pages of each monthly preliminary data report are filed in the IMC and kept on file permanently. Two copies of each report are made and delivered to:

- The site operator.
- The NPS ARD in Lakewood, Colorado.

4.6.3 Distribution of Annual Data Reports

The unbound original pages and one bound copy of each annual data summary report are filed in the IMC. The originals are kept on file permanently. Eleven (11) copies of each report are made. In addition, four (4) CD-ROMs containing monthly data files for all sites for the reported year and five (5) diskettes for each reported site containing monthly data files are created. The reports, CDs, and diskettes are distributed as detailed in Table 4-1:

Table 4-1

Report Product Distribution

Recipient	Unbound Report	Bound Report	CD	Diskette
Site operator		1		
Park superintendent		2		1
NPS ARD	1	2	2	
NPS Regional Air Quality Coordinator		1		3
TIC (NPS Clearinghouse)	1			
Non-NPS Agency Site Operators		1		1
IMC Contractor (ARS)	1	1	2	
Totals	3	8	4	5

4.6.4 Distribution of Monthly Ozone Hit Lists

The Ozone Hit List is distributed to:

- The NPS ARD.
- The field maintenance group project manager.
- Each member of the IMC staff.

4.6.5 Distribution of Data Requests

Each data request is distributed to the person making the request. The Data Request Form and copies of related documentation are filed in the IMC and kept on file for one year. In certain situations, a copy of the digital data delivered is archived permanently.

4.7 SUBMITTING DATA TO THE EPA AIRS DATABASE

The steps required to submit data to the EPA AIRS database are:

- Create the AIRS transaction files for hourly average criteria pollutant and meteorological data.
- Create the AIRS transaction files for precision data from criteria pollutant analyzer precision checks (typically one per week).
- Create the AIRS transaction files for accuracy data from audit reports on criteria pollutant analyzers (typically one every 6 months to one year).
- Transfer the files to AIRS using FTP (file transfer protocol).
- Load data into the AIRS screening file(s), successfully run the AIRS edit programs, and lock the screening file(s) for update to the AIRS database.

These steps are detailed in TI ____-____, *Submitting Ambient Air Quality and Meteorological Data to the EPA AIRS Database*.

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1.0 PURPOSE AND APPLICABILITY

This technical instruction (TI) describes the steps of producing ambient air quality and meteorological monthly data reports, and is referenced from SOP 3550, *Ambient Air Quality and Meteorological Data Reporting*. Reporting of Ambient Air Quality and Meteorological Monitoring by the National Park Service (NPS) Information Management Center (IMC) includes preparation and distribution of the following monthly report products:

- Monthly progress reports
- Monthly preliminary data reports
- Monthly ozone "hit list"; a listing of ozone hourly averages exceeding 100 ppb

Monthly progress reports summarize the technical aspects of the National Park Service Ambient Air Monitoring Assistance Contract performed during the reported month. These reports include the technical progress of both network operations and information management tasks, along with project-related milestones and maintenance schedules.

Monthly preliminary data reports provide the National Park Service Air Resources Division (NPS ARD) personnel, individual station operators, and other project-related personnel the opportunity to review and comment on preliminary ambient ozone (O_3) and/or sulfur dioxide (SO_2) data and associated meteorological data collected at individual monitoring sites. A separate report is prepared for each monitoring site operating during the reported month.

The monthly ozone "hit list" is a list of ozone hourly averages exceeding 100 ppb indicating the locations and frequency of high ozone values. This list is forwarded to the NPS Air Resources Division (ARD).

2.0 RESPONSIBILITIES

2.1 DATA COORDINATOR

The data coordinator shall:

- Verify that preliminary data validation has been successfully completed for the monthly reported data.
- Prepare the report tables and plots for monthly reports that correctly reflect the validated data.
- Generate the Validation Progress Report Table for the monthly progress report and verify that it is correct.
- Summarize and forward items discussed in the monthly plot review to the technical assistant for inclusion in the monthly progress report.

- Prepare and forward the monthly ozone “hit” list to the NPS ARD.
- Submit data to the EPA AIRS database.
- Handle all data requests.

2.2 DATA ANALYST AND DATA TECHNICIAN

The data analyst and data technician shall assist the data coordinator with the preparation, review, and correction of monthly preliminary data reports.

2.3 TECHNICAL ASSISTANT

The technical assistant shall:

- Assemble and organize the information for the monthly progress report.
- Word process the text portions of the report.
- Copy and mail the reports to each recipient.
- Prepare accompanying cover letters for data requests.

3.0 REQUIRED EQUIPMENT AND MATERIALS

Microsoft Word for Windows 97 is used to word process the text portions of monthly data reports. Monthly data report tables and plots are generated by programs in the Air Quality Database Management System (AQDBMS).

3.1 THE AIR QUALITY DATABASE MANAGEMENT SYSTEM (AQDBMS)

The Air Quality Database Management System (AQDBMS) is the primary tool used to validate ambient air quality and meteorological data. The Air Quality Database Management System (AQDBMS) is comprised of two main components:

- An Oracle database specifically designed and developed by Air Resource Specialists (ARS) to hold air quality network data and to accommodate the many temporal, spatial, and functional variations found within an air quality network.
- Customized software programs developed by Air Resource Specialists that provide an interface to the Oracle database.

3.1.1 System Hardware Requirements

The AQDBMS requires the following hardware:

- Workstations - Networked Intel Pentium-based workstations with at least 16MB of RAM (32MB recommended), 1024 x 768 resolution (recommended large fonts, 17 inch or larger monitor), 40MB of available hard disk space, and a mouse.

- Database Server - An Intel Pentium-based database server with hard disks providing at least 2 gigabytes of storage and at least 48MB of RAM, color monitor, mouse, CD-ROM, and back-up device.

- Reporting - High-resolution laserjet or inkjet printer for printing.

3.1.2 System Software Requirements

The AQDBMS requires the following commercial software:

- PC operating system - Microsoft Windows95.

- Network operating system - Novell Netware 3.12 or 4.11; IPX protocol.
- Database engine - The Oracle 7 (version 7.2 or 7.3) Workgroup Server for Netware Relational Database Management System (RDBMS).

- Database connectivity - Oracle SQL*Net (version 2.2 or 2.3) IPX protocol adapter. Oracle ODBC Driver for Oracle version 2.05 or later.

- User interface - Powersoft PowerBuilder version 5.0.02 run-time libraries. Microsoft VisualBasic version 5.0 run-time libraries.

The AQDBMS requires the following ARS-developed software:

- User interface for loading, screening, validation, reporting, creation of AIRS files, etc. – PowerBuilder executables (ESD.exe and .PBD files). VisualBasic executables (vbrose32.exe, diur32.exe, vbbar32.exe, stkwin.exe vbsum32.exe).

4.0 METHODS

One monthly progress report for the network is generated each month. Separate monthly reports are produced for each site collecting data during the month. The ozone “hit” list is generated from raw data in the AQDBMS database.

This section contains the following three (3) major subsections:

4.1 Monthly Progress Report
4.2 Monthly Preliminary Data Report
4.3 Monthly Ozone Hit List

4.1 MONTHLY PROGRESS REPORT

Monthly progress reports summarize the progress of network-related tasks during the report month. This report is completed and distributed by the 10th of the month following the reported month. Specific content of the progress report varies from month to month, however, each report generally includes the following:

- An introduction including current monitoring site map.
- Task progress updates, milestones, and site visits relating to operational monitoring support.
- Task progress updates, milestones, and ARS/NPS team meetings relating to data collection and validation.
- Contract administration items.

Using the previous month's report as a template, the technical assistant goes through each page of the report and makes updates with information from the Site Status Log, trip reports, and other information forwarded by the IMC staff and field specialists.

4.2 MONTHLY PRELIMINARY DATA REPORT

Monthly data reporting includes generating a preliminary data report for each site in the NPS Ambient Air Quality Monitoring Program Network where data were collected during the reported period. Monthly preliminary reports are completed and distributed within 60 days following the reported month as the culmination of data validation (see Figure 4-1).

The main steps taken to report monthly data are:

- Determine the specific contents needed for each site's report.
- Generate and compile the contents of each report.
- Review reports.
- Make corrections and regenerate affected contents.
- Copy and distribute the reports.
- Regenerate report pages if changes are made due to comments received.

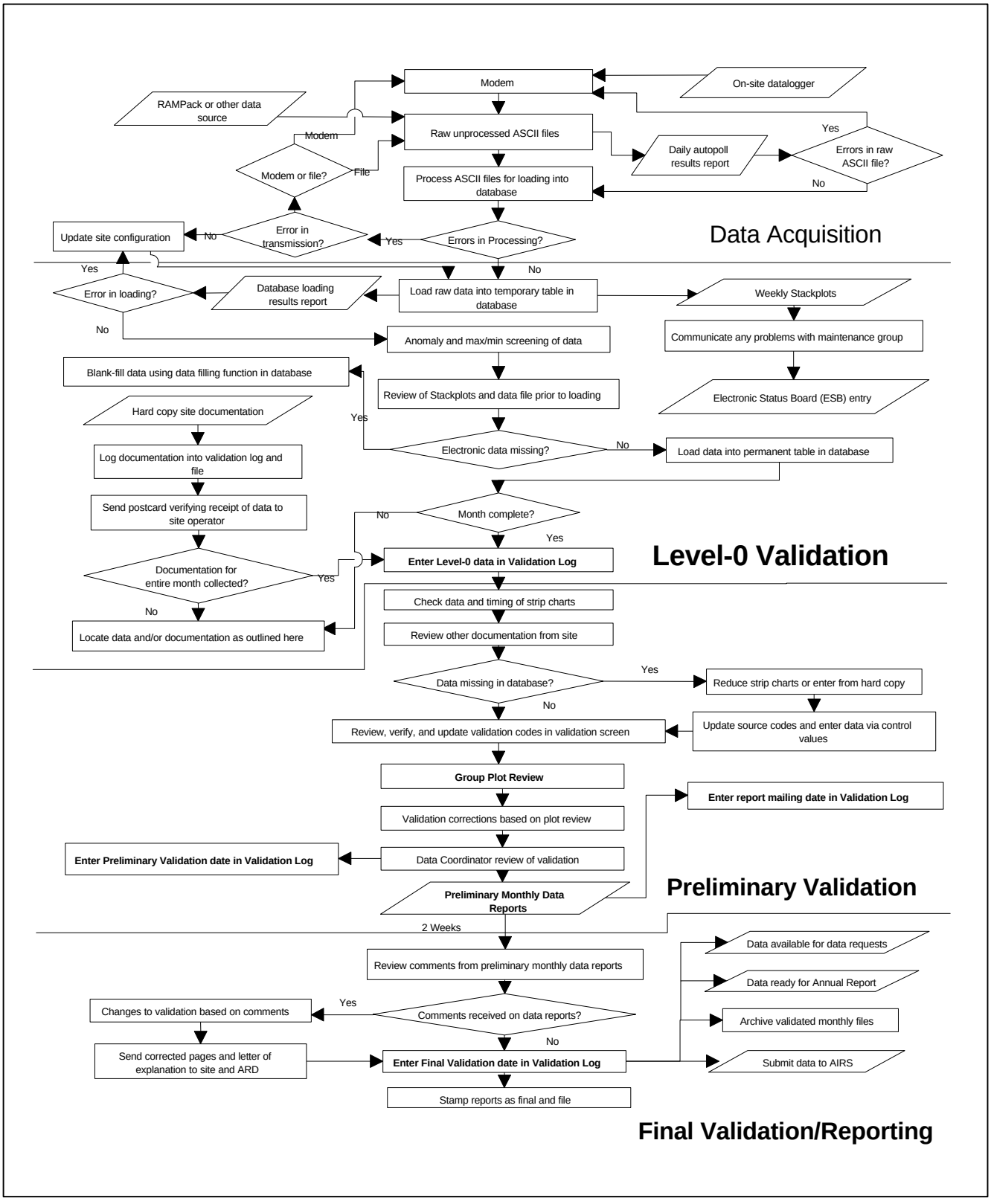

Figure 4-1. NPS Ambient Air Quality and Meteorological Monitoring Network Data Collection, Validation, and Reporting Flow Diagram.

4.2.1 Preliminary Data Report Contents

Before generating report contents, the data coordinator determines which sites are to be reported and the output that needs to be included in each site's report. Each preliminary data report contains the following sections and products:

- Introduction
- Data Summaries and Statistics
- Data Collection Statistics Table
- Stackplots for all parameters, one plot for each 7 or 8 days
- Meteorological Parameter Summary Table
- Wind Rose Plot

At each site where ozone is monitored, the preliminary data report includes:

- Ozone Values Versus National Ambient Air Quality Standards (NAAQS) Table (Ten Highest Daily 1-Hour Average Ozone Concentrations)
- Diurnal Ozone Plot
- Ozone Pollutant Rose Plot
- Ozone Hourly Average Table

At each site where sulfur dioxide is monitored, the preliminary data report includes:

- Sulfur Dioxide Values Versus National Ambient Air Quality Standards (NAAQS) Table (Five Highest Daily 1-Hour Average, Five Highest 3-Hour Block Average, and Five Highest 24-Hour Average Sulfur Dioxide Concentrations)
- Diurnal Sulfur Dioxide Plot
- Sulfur Dioxide Pollutant Rose
- Sulfur Dioxide Hourly Average Table

At each site where supplemental sulfur dioxide is monitored, the preliminary data report includes:

- Supplemental Sulfur Dioxide Values Versus National Ambient Air Quality Standards (NAAQS) Table (Five Highest Daily 1-Hour Average, Five Highest 3-Hour Block Average, and Five Highest 24-Hour Average Sulfur Dioxide Concentrations)
- Diurnal Supplemental Sulfur Dioxide Plot
- Sulfur Supplemental Dioxide Pollutant Rose
- Sulfur Supplemental Dioxide Hourly Average Table

4.2.2 Generating a Preliminary Data Report

The steps taken to generate each monthly preliminary data report are:

- Verify completion of preliminary data validation of the reported data.
- Print report tables.
- Create Stackplot data files.
- Print report plots.
- Print the cover page and text pages.
- Print review checklists.
- Review reports.
- Make corrections.
- Copy and mail reports, file original.
- Replace pages affected by changes resulting from comments.
- Stamp original report “final”.

The following subsections explain how each step is accomplished.

4.2.2.1 Verifying Preliminary Validation Status

Before a preliminary data report for a site can be generated, preliminary data validation must be complete. The validation status of each site is tracked in the AQDBMS Data Validation Log.

To verify that data for a site/month are at preliminary validation level:

- Launch the IMC application.
- Select **Log** from the “Data Validation” menu.
- Click the **down arrow** in the “Search for Site” box.
- Select a site from the list. If no records for the selected site exist, a "Site not Found" message is displayed. Click **OK**. Otherwise, the most recent master table record and related details for the selected site are displayed.
- Use the **Move To** buttons at the top of the screen to display the record for the month to be reported.
- Verify that a valid date has been entered in the “Preliminary Validation Date” box.
- Repeat these steps for each site to be reported.

For more information on using the Data Validation Log, see the *AQDBMS User's Guide* (ARS, 1997).

4.2.2.2 Generating Report Tables and Stackplot Data Files

The report tables have been printed extensively on Hewlett-Packard (HP) Laserjet 4/4M printers. Before generating the monthly report tables, verify the optimum settings.

To set optimum printer settings for text output:

- Select **Print Setup** from the "File" menu.
- Click to select the HP Laserjet 4 or 4M printer, then click the **Setup** button.
- Click on the **Graphics** tab.
- Click the **down arrow** in the "Resolution" box, then select **600 dots per inch**.
- Click the **Use vector graphics** radio button in the "Graphics mode" section.
- Click the **Fonts** tab, then click the **Download TrueType fonts** as outline soft fonts button.

Monthly report tables and Stackplot data files are generated via an interface that has been developed to enable batch printing for any combination of sites, time periods, and documents to print.

To generate monthly report tables and Stackplot data files via the batch-printing interface:

- Launch the IMC application.
- Select **Batch Printing** from the "Reports" menu.
- Select the **month/year** to report in the beginning month and year boxes.
- Select the same **month and yea**r in the ending month and year boxes.
- Select sites:
  - To select all sites, click the **Add All** button.
  - To select a group of sites from the list, click on the first site in the group then hold down the shift key and click the last site. All two clicked sites and all sites in between will be selected.
  - To select multiple sites not in a group, click on the first site you want then hold down the control key as you click additional sites.
- Select **O_3** and **SO_2** in the "Parameters" list.
- Select the output. Use the same methods for selecting as in step 4 or click the **all monthly** button to automatically select the following required monthly reports/files:

- ASCII Stackplot file using monthly configuration table
- Monthly grids for selected parameters
- Data collection statistics
- Meteorological Data Summary
- O_3 - highest concentrations
- SO_2 - highest concentrations

- Check the **Send to Printer** box.
- Click the **Go** button.

The report tables are printed on the currently selected printer. The "ASCII Stackplot file using monthly configuration table" item will create an ASCII data file for each selected site to be used by the Stackplot program. Usually, a Stackplot file for each site has already been generated as part of the preliminary validation process (see TI 3450-5010, *Ambient Air Quality and Meteorological Data - Preliminary Validation*). If so, it does not need to be regenerated. For more information on using this interface, refer to the *AQDBM User's Guide* (ARS, 1997).

4.2.2.3 Generating Report Plots

The report plots have been printed extensively on Hewlett-Packard (HP) Laserjet 4/4M printers. Before generating the monthly report plots, verify the optimum settings.

To set optimum printer settings for graphics output:

- Select **Print Setup** from the "File" menu.
- Click to select the HP Laserjet 4 or 4M printer, then click the **Setup** button.
- Click on the **Graphics** tab.
- Click the **down arrow** in the "Resolution" box, then select the optimum dots per inch (dpi). Select **300** for Rose and Bar plots. Select **600** for all other plots.
- Click the **Use raster graphics** radio button in the "Graphics mode" section.
- Click the **Fonts** tab then click the **Print True Type as graphics** button.

Monthly preliminary reports include several plots. Each plot is generated by executing one of the AQDMBS graphics programs as follows:

Plot	Program
Diurnal Plot (Ozone and Sulfur Dioxide)	Aqdiur.exe
Pollutant Rose Plot (Ozone and Sulfur Dioxide)	Aqrose.ese
Data Summary Bar Plot (Ozone and Sulfur Dioxide)	Aqbar.exe
Wind Rose Plot	Aqrose.ese
Stackplot	Stkwin.exe

To generate any of the plots except Stackplot:

- Select the desired graphics product from the "Plots" menu in the AQDBMS
  -or-
  Double click the icon for the desired graphics product on the Windows desktop.

- Set up the printer:

  - Choose **Select Printer** from the "File" menu.

  - Select the desired printer destination.

  - Set the paper orientation for the current graphic product (all are portrait except the Data Summary Bar Plot which is landscape).

- Select a site from the "Select Site" drop-down list box.

- Enter the start and end dates for the period to be plotted in the "Start" and "End" boxes.

- Click the **Get Parameter List** button. The program retrieves a parameter code list for the selected site/period.

- Select the parameter to be plotted from the "Available Parameter List" drop-down list box.

- If you want the plot to print automatically, click the **AutoPrint** checkbox.

- Click the **Draw Plot** button. The program retrieves and plots the data.

- If needed, modify the default graph scaling values, then click the **Redraw** button.

- Click the **Print** button to print the plot.

Plots can be created for multiple sites/parameters for the same month. To create multiple plots in a single run, a submit file containing a list of the sites/parameters to be plotted is created in advance. The sites/parameters included in a submit file will be plotted with common options. Sites with parameters that do not use common options--such as a scaling change--must be run in single site mode. Create separate submit files for each of the graphics products.

To create a submit file:

- Open a new file in a text file editor such as Windows Notepad (**do not** use a word processor such as Word for Windows).
- On the first line of this file:
  - Type a four-character site abbreviation followed by a comma.
  - Type a parameter abbreviation followed by a hyphen and a comma.
  - Type a **Y** followed by a comma.
  - Type three more commas, then press **Enter.**

  For example, type **BIBE,O3-,Y,,,,** to plot ozone data for Big Bend.
- Repeat step 2 for each combination of site/parameter that you want to include in the batch of plots.
- Select **Save As** from the **File** menu. Save the file in the folder \\ars net3\project\npsair\sitecall\monthly\batch.

To create plots for multiple sites:

- Select the desired graphics product from the "Plots" menu in the AQDBMS
  -or-
  Double click the icon for the desired graphics product on the Windows desktop.
- Set up the printer:
  - Choose **Select Printer** item from the "File" menu.
  - Select the desired printer destination.
  - Set the paper orientation for the current graphic product (all are portrait except the One-Year Summary plot which is landscape*).*
- Enter the start and end dates for the period to be plotted in the "Start" and "End" boxes.
- If you do not want plots to print automatically, click the **AutoPrint** checkbox to deselect the auto-printing feature.
- Select **Run a Submit File** from the "File" menu.
- Select the submit file you previously created from the file-open dialogue box and click **OK**.

To generate the required Stackplots for each monthly preliminary data report, the following files are required:

- An ASCII data file containing the monthly data for the site.
- A *stk* file containing the Stackplot configuration information for the site.

To generate a Stackplot:

- Launch STKWIN.exe from either the Windows desktop or from the "Stackplot" command of the "Plots" menu in the IMC application.
- Select **File/Open** and choose a *stk* file from the correct directory.
- Click **Start.**
- Click **Print** to send a hard copy of the plot to the printer.

To generate Stackplots using a submit file:

- Launch STKWIN.exe from either the Windows desktop or from the "Stackplot" command of the "Plots" menu in the IMC application.
- Select **File/Open** and choose a *sbm* file.
- Click **Start.**
- **C**heck **Autoprint** and **Continuous**.
- Click **Draw**.

For more information on generating plots, see the *AQDBMS User's Guide* (ARS, 1997).

4.2.3 Reviewing Reports

A report review form is attached to each report and is used to log comments and error corrections to the reports and/or data during the review process. An example report review form is shown in Figure 4-2.

Each monthly preliminary data report is reviewed by at least three IMC staff people. If errors are found, corrections are made and the affected report contents regenerated. After the review period is complete, the report review form is removed from the report and kept on file in the IMC for 6 months.

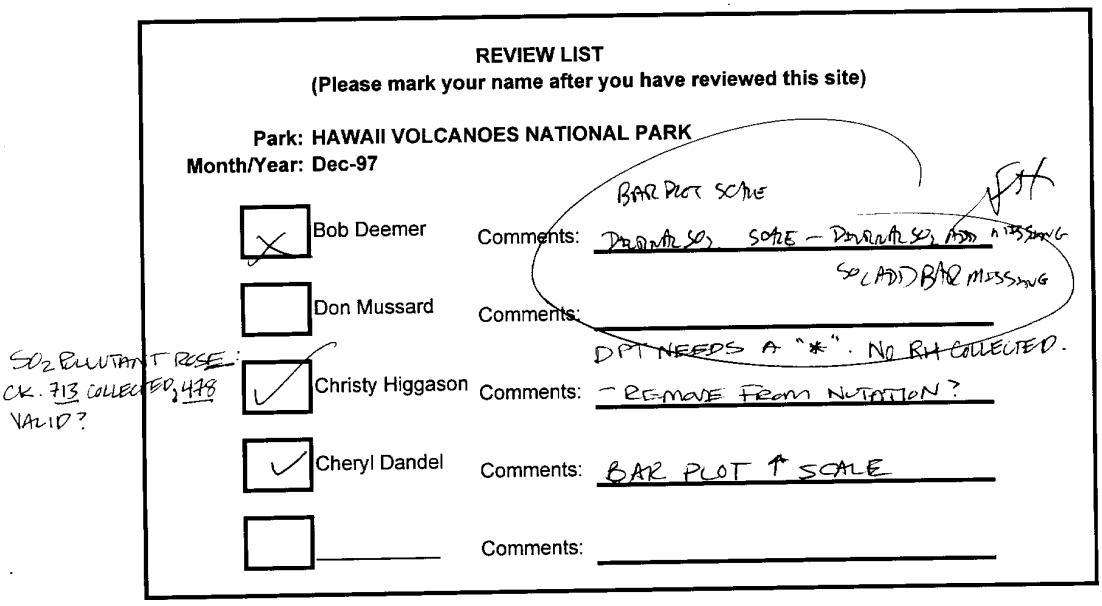

Figure 4-2. Example Report Review Form.

4.2.4 Distributing Reports

The original pages of each monthly preliminary data report are filed permanently in the IMC. Two copies of each report are made and sent to:

- The site operator.
- The NPS ARD in Lakewood.

4.2.5 Regenerating Report Pages Due to Comments Received

As part of the final validation process, recipients of preliminary data reports are given weeks to review the reports and respond to the IMC with comments. If no comments are received, the original reports are stamped "Final". If comments are received, the data coordinator evaluates them and data validation changes are made accordingly (for more information on this process, see TI 3450-5020, *Ambient Air Quality and Meteorological Data - Final Validation)*. Pages affected by changes are regenerated and replaced in the monthly preliminary data report. Changes are noted on the cover of the report. The regenerated pages are copied and sent to the site operator and NPS ARD with a cover letter explaining the changes. Copies of the cover letters regarding changes are kept in the sites' correspondence files.

4.3 MONTHLY OZONE HIT LIST

The monthly ozone "hit list" is a list of ozone hourly averages exceeding 100 ppb for all sites for the month and is generated from raw data at the end of every month during the ozone season, which is May through September. An example hit list is shown in Figure 4-3. Since the data have not yet been validated, the data coordinator reviews the list and excludes values recorded during obvious non-ozone events such as daily zero/span calibrations.

To generate the ozone hit list:

- Collect the raw stack plots for all sites for the month.
- Launch the IMC application.
- Select **Batch Printing** from the "Reports" menu.
- Select the month/year to report in the beginning month and year boxes.
- Select the same month and year in the ending month and year boxes.
- Click the **Select All** button to select all sites.
- Deselect the **Send to Printer** box.
- Select **O_3 - RAW Episodes with Concentrations > 100 ppb**.

Episodes with 1-Hour Ozone Concentrations > 100 ppb and > 124 ppb
Time Period: 10/01/97 - 10/31/97
RAW DATA: This data has not been validated
Data users should acknowledge the National Park Service Air Resources Division

Site Abbr	Beginning Date	Hour	No. of Hours >100 ppb	>=124 ppb	Max (ppb)
GSCM	10/01/97	14	02	02	174
MAHM	10/08/97	12	02	02	203
MORA	10/14/97	13	01	01	242
SHBM	10/17/97	10	02	01	157
Totals			007	006	242

Figure 4-3. Example Ozone Hit List.

- Click **GO.** The message "Writing Reports/Files for XXXX RAW Ozone > = 100 ppb"" where XXXX is the four-letter abbreviation for the site). When finished, a table containing the ozone episodes is displayed.

- Examine the raw plots compared to the table on the screen and deselect the events that are not real ozone events. Click the **check box** to the right of the row to remove the check mark. Unmarked rows are not be printed.

- Click on **Print to File** to create an ASCII file.

- Click on **Print** to generate a printed copy.

The ASCII file is sent via e-mail to the NPS ARD. Copies of the printed table are forwarded to the field specialists and IMC staff.

5.0 REFERENCES

Air Resource Specialists, Inc. (ARS), 1997, AQDBMS User's Guide.

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1.0 PURPOSE AND APPLICABILITY

This technical instruction (TI) describes the steps of producing ambient air quality and meteorological annual data reports, and is referenced from SOP 3550, *Ambient Air Quality and Meteorological Data Reporting*. Annual data summary reports highlight the average range and frequency of data collected at a monitoring site during the year. These summaries provide information on the status and trends of air quality conditions and help determine if a site is exceeding the National Ambient Air Quality Standards (NAAQS) established by the U.S. Environmental Protection Agency (EPA). A report is generated for each network site where monitoring occurred during the reported year. The National Park Service Air Resources Division (NPS ARD) may request that data from specific non-network sites be reported also.

2.0 RESPONSIBILITIES

2.1 DATA COORDINATOR

The data coordinator shall:

- Verify that final data validation has been successfully completed for annual reported data.
- Prepare the report tables and plots for annual reports that correctly reflect the validated data.

2.2 DATA ANALYST AND DATA TECHNICIAN

The data analyst and data technician shall assist the data coordinator with the preparation, review, and correction of annual data reports.

2.3 TECHNICAL ASSISTANT

The technical assistant shall:

- Word process the text portions of the reports.
- Generate the maps and site specification pages for each report.
- Copy and mail the reports to each recipient.

3.0 REQUIRED EQUIPMENT AND MATERIALS

Data report tables and plots are generated by programs in the Air Quality Database Management System (AQDBMS). The software and hardware requirements for the AQDBMS are listed in the following subsections. Additional software and hardware requirements for creating annual reports are:

- Microsoft Word for Windows 97 for word processing text pages and to compile each site specification page.

- MapViewer software for creating monitoring network maps.

- Hewlett-Packard DeskScan software and a high-resolution, flat-bed scanner for creating images of topographic maps and site photographs.

- Write-capable CD-ROM drive for creating data CDs.

3.1 THE AIR QUALITY DATABASE MANAGEMENT SYSTEM (AQDBMS)

The Air Quality Database Management System (AQDBMS) is the primary tool used to validate ambient air quality and meteorological data. The Air Quality Database Management System (AQDBMS) is comprised of two main components:

- An Oracle database specifically designed and developed by Air Resource Specialists (ARS) to hold air quality network data and to accommodate the many temporal, spatial, and functional variations found within an air quality network.

- Customized software programs developed by Air Resource Specialists that provide an interface to the Oracle database.

3.1.1 System Hardware Requirements

The AQDBMS requires the following hardware:

- Workstations - Networked Intel Pentium-based workstations with at least 16MB of RAM (32MB recommended), 1024 x 768 resolution (recommended large fonts, 17 inch or larger monitor), 40MB of available hard disk space, and a mouse.

- Database Server - An Intel Pentium-based database server with hard disks providing at least 2 gigabytes of storage and at least 48MB of RAM, color monitor, mouse, CD-ROM, and back-up device.

- Reporting - High-resolution laserjet or inkjet printer for printing.

3.1.2 System Software Requirements

The AQDBMS requires the following commercial software:

- PC operating system - Microsoft Windows95.

- Network operating system - Novell Netware 3.12 or 4.11; IPX protocol.

- Database engine - The Oracle 7 (version 7.2 or 7.3) Workgroup Server for Netware Relational Database Management System (RDBMS).

- Database connectivity - Oracle SQL*Net (version 2.2 or 2.3) IPX protocol adapter. Oracle ODBC Driver for Oracle version 2.05 or later.

- User interface - Powersoft PowerBuilder version 5.0.02 run-time libraries. Microsoft VisualBasic version 5.0 run-time libraries.

The AQDBMS requires the following ARS-developed software:

- User interface for loading, screening, validation, reporting, creation of AIRS files, etc. – PowerBuilder executables (ESD.exe and .PBD files). VisualBasic executables (vbrose32.exe, diur32.exe, vbbar32.exe, stkwin.exe vbsum32.exe).

4.0 METHODS

Separate annual reports are produced for each site collecting data during the monitoring period. In addition, annual reports are generated for selected NPS sites that are not part of the NPS Ambient Air Quality Monitoring Program Network. At these sites, data were collected, validated, and submitted to the EPA AIRS database by another agency. The data are downloaded from AIRS and loaded into the AQDBMS database. Annual data summary reports are completed and distributed by August 31 following the reported year.

This section contains the following three (3) major subsections:

4.1 Annual Data Report Contents
4.2 Non-Network Data
4.3 Generating Annual Data Reports
4.4 Reviewing Reports
4.5 Distribution

4.1 ANNUAL DATA REPORT CONTENTS

Before generating report contents, the data coordinator determines which sites are to be reported and the output that needs to be included in each site's report. A master check-list is created to track this large volume of output.

Each annual data summary report contains the following sections and products:

- Section 1.0 Introduction:

  - A description of the monitoring network including a site map.

  - A detailed description of the individual monitoring site including a site specifications map.

- Section 2.0 Data Summary:

  - Data collection statistics.

- Stackplots of all parameters, one for each quarter year.

- Summary of selected mteorological data.

At sites where wind speed and wind direction were collected, this section also includes:

- Quarterly wind rose plots.

- Annual wind rose plot.

At sites where ozone was monitored during the year, this section also includes:

- Ozone Precision Check Data Summary.

- Ozone Quick Look Annual Summary Statistics.

- Ozone Annual Frequency Distribution.

- Ozone Standards Report and Maximum 1-hour Concentrations.

- EPA Proposed Primary Ozone Standards Attainment Status.

-EPA Proposed Secondary Ozone Standards Attainment Status.

- Ten Highest Daily 1-Hour Average Ozone Concentrations.

- Episodes with 1-Hour Ozone Concentrations >= 100 ppb and > 124 ppb.

- Ozone Rank Listings of Second Highest 1-Hour Average Concentrations, Maximum 8-Hour Average Concentrations, and Annual Sum60 Exposure Index for All NPS Monitoring Sites.

- Ozone Three Year Comparison of Second Highest Concentrations.

- Quarterly Diurnal Ozone Plots.

- Annual Diurnal Ozone Plot.

At sites where sulfur dioxide was monitored during the year, this section also includes:

- Sulfur Dioxide Precision Check Data Summary.

- Sulfur Dioxide Quick Look Annual Summary Statistics.

- Sulfur Dioxide Annual Frequency Distribution.

- EPA Proposed Primary Sulfur Dioxide Standards Attainment Status.

- Five Highest Daily 1-Hour Average, Five Highest 3-Hour Block Average, and Five Highest 24-Hour Average Sulfur Dioxide Concentrations.

- Sulfur Dioxide Standards Report and Daily Maximum 1-Hour Concentrations Table.

- Sulfur Dioxide Standards Report and Daily Maximum 3-Hour Concentrations Table.
- Sulfur Dioxide Standards Report and Daily Maximum 24-Hour Concentrations Table.
- Sulfur Dioxide Three Year Comparison of Second Highest Concentrations.
- Quarterly Diurnal Sulfur Dioxide Plots.
- Annual Diurnal Sulfur Dioxide Plot.

At each site where a supplemental sulfur dioxide monitor collected data during the year, this section also includes:

- Supplemental Sulfur Dioxide Precision Check Summary.
- Supplemental Sulfur Dioxide Five Highest Daily 1-Hour Averages, 3-Hour Block Averages, and 24-Hour Block Averages.
- Supplemental Sulfur Dioxide Three Year Comparison of Second Highest Concentrations.
- Quarterly Diurnal Supplemental Sulfur Dioxide Plots.
- Annual Diurnal Supplemental Sulfur Dioxide Plot.
- Quarterly Supplemental Sulfur Dioxide Pollutant Roses.
- Annual Supplemental Sulfur Dioxide Pollutant Rose.

- Section 3.0 National Park Service Air Resources Division Data Sources:
  - Data Disk Contents
  - NPS IMC and AIRS Invalid Data Codes
  - Other Sources for Retrieving NPS Gaseous Pollutant Data
- Section 4.0 Glossary:
  - Definitions and Computational Procedures for NPS Quick Look Annual Summary Statistics Table
  - Air Quality Glossary

4.2 NON-NETWORK DATA

The NPS ARD provides a list of non-network sites at NPS units that are reported in addition to the network sites for each annual reporting period. Data for these sites were collected, validated, and submitted to the EPA AIRS database by other agencies. Data are retrieved from AIRS and loaded into the AQDBMS database to facilitate production of annual data summary reports for these sites.

4.2.1 Retrieving and Downloading Data From AIRS

The AQDBMS includes a program for loading data from Type 1 (one-hour average data) AIRS records. Before the data can be imported. however, they must be retrieved and downloaded from AIRS. Refer to Section 5.0 *Retrieving and Downloading Data From AIRS* in the *AQDBMS AIRS Reference*.

4.2.2 Importing AIRS Data into the AQDBMS Database

In order for all data from an AIRS file to be successfully imported, site and parameter information must be defined in the AQDBMS database for the AIRS codes encountered during the import. If the program finds undefined codes, an error message is written to a log file, and the undefined AIRS record written to a redo file. The data coordinator then creates the necessary new records in the database tables and runs the program again until all data is imported without error. For instructions on adding site and parameter information to the AQDBMS see SOP ____, Data Coordinator's Maintenance Responsibilities in the AQDBMS. Refer to Section 2.11 *Importing Data from AIRS Transaction Files* in the *AQDBMS User's Guide* (ARS, 1997) for instructions on importing a downloaded AIRS file into the AQDBMS Database.

4.3 GENERATING ANNUAL DATA REPORTS

The steps taken to produce each annual data summary report are:

- Verify completion of final data validation of the reported data.
- Generate report tables.
- Generate Stackplot data files.
- Generate monthly columnar data files.
- Generate report plots.
- Generate text pages.
- Generate map pages.

The following subsections explain how each step is accomplished.

4.3.1 Verifying Final Validation Status

Before an annual data summary report for a site can be generated, final data validation must be complete. The validation status of each site is tracked in the AQDBMS Data Validation Log. A Data Validation Log record must also exist for each non-network site to be reported.

To verify that data for a site/month are at final validation level:

- Launch the IMC application.
- Select **Log** from the “Data Validation” menu.
-
- Click the **down arrow** in the “Search for Site” box.
- Select a site from the list. If no records for the selected site exist, a "Site not Found" message is displayed. Click **OK**. Otherwise, the most recent master table record and related details for the selected site are displayed.
- Use the **Move To** buttons at the top of the screen to display the record for the last month (usually December) reported for the selected site during the year to be reported.
- Verify that a valid date has been entered in the “Final Validation Date” box.
- Repeat these steps for each site to be reported.

To add a data validation record for a non-network site:

- Launch the IMC application.
- Select **Log** from the “Data Validation” menu.
- Locate the “Record Actions” box at the top of the screen.
- Click the **Insert Master** button. A blank master record appears and the detail table is cleared.
- Click the **down arrow** in the “Site” box and select a site. The program will fill in the site number for the selected site.
- The “Year” box defaults to the current year; enter the **year** if other than the default for the record you're creating.
- Click in the **Month** box and select the month (usually December) for the record you're creating.
- Enter the **date** the data were downloaded from AIRS into the “Final Validation Date” box and **AIRS** in the “Final Validation Initials” box.

For more information on using the Data Validation Log, see the *AQDBMS User’s Guide* (ARS, 1997).

4.3.2 Generating Report Tables and Data Files

The report tables have been printed extensively on Hewlett-Packard (HP) Laserjet 4/4M printers. Before generating the annual report tables, verify the optimum settings.

To set optimum printer settings for text output:

- Select **Print Setup** from the "File" menu.
- Click to select the HP Laserjet 4 or 4M printer, then click the **Setup** button.
- Click on the **Graphics** tab.
- Click the **down arrow** in the "Resolution" box, then select **600** dots per inch.
- Click the **Use vector graphics** radio button in the "Graphics mode" section.
- Click the **Fonts** tab, then click the **Download TrueType fonts as outline soft fonts** button.

Several annual report tables, monthly data files, and Stackplot data files are generated via an interface that has been developed to enable batch output for any combination of sites, time periods, and documents to print. Because of the volume of data reported and the number of output products required to make all of the annual data summary reports, it is unlikely that all products for all sites for the entire year can be generated from this interface in one pass. However, the batch output capabilities of the interface can still be used to generate numerous output products in one process and can be left to run overnight. Most errors encountered during the process will be written to a log file and will not halt processing.

To generate report tables, monthly data files, and Stackplot data files via the batch-printing interface:

- Launch the IMC application.
- Select **Batch Printing** from the "Reports" menu.
- Select **January** in the "Beginning Month" box.
- Select the **report year** in the "Beginning Year" box.
- Select **December** in the "Ending Month" box.
- Select the **report year** in the "Ending Year" box.
- Select sites:

To select all sites, click the **Select All** button.

To select a group of sites from the list, click on the first site in the group then hold down the shift key and click the last site. All two clicked sites and all sites in between will be selected.

To select multiple sites not in a group, click on the first site you want then hold down the control key as you click additional sites.

- Select parameters. Use the same methods for selecting as in step 6.
- Select the output. Use the same methods for selecting as in step 6. The output products from this list that are included in an annual data summary report are:
  - Monthly grids for selected parameters (to create files, uncheck the **Send to Printer** box and check the **Print to file** box).
  - Data collection statistics
  - Meteorological Data Summary
  - O_3 – Highest Concentrations
  - O_3- Episodes with Concentrations > 100 ppb
  - SO_2 – Highest Concentrations
  - Precision Check Summary (Annual Only for O_3 and SO_2)
  - ASCII Stackplot file using selected parameters
  - Yearly Frequency Distribution for O_3 or SO_2
- Check the **Send to Printer** box.
- Click the **Go** button.

The report tables are printed on the currently selected printer. The "Monthly Data Grid" item creates an ASCII file for each site/parameter/month combination selected. The "ASCII Stackplot file using selected parameters" item will create an ASCII data file for each selected site to be used by the Stackplot program. Files are placed in the directory indicated in the "Enter location to write files to" box. For more information on using this interface, refer to the *AQDBM User's Guide* (ARS, 1997).

One report table includes data from all sites in the annual data summary report:

- Ozone Rank Listings of Second Highest 1-Hour Average Concentrations, Maximum 8-Hour Average Concentrations, and Annual Sum60 Exposure Index for All NPS Monitoring Sites.

To generate the Ozone Rank Listings Table:

- Launch the IMC application.
- Select **Ozone Rank Listing** from the "Reports" menu.
- A dialogue box is displayed. Click **Yes** to run the report or **No** to cancel.

Note. Start this report at the end of the day since it can take more than an hour to complete.

4.3.3 Generating Report Plots

The report plots have been printed extensively on Hewlett-Packard (HP) Laserjet 4/4M printers. Before generating the monthly report plots, verify the optimum settings.

To set optimum printer settings for graphics output:

- Select **Print Setup** from the "File" menu.
- Click to select the HP Laserjet 4 or 4M printer, then click the **Setup** button.
- Click on the **Graphics** tab.
- Click the **down arrow** in the "Resolution" box, then select the optimum dots per inch (dpi). Select **300** for rose and bar plots. Select **600** for all other plots.
- Click the **Use raster graphics** radio button in the "Graphics mode" section.
- Click the **Fonts** tab, then click the **Print True Type as graphics** button.

Annual data summary reports include several plots. Each plot is generated by executing one of the AQDMBS graphics programs as follows:

Plot	Program
Diurnal Plot (Ozone and Sulfur Dioxide)	Aqdiur.exe
Pollutant Rose Plot (Ozone and Sulfur Dioxide)	Aqrose.ese
Data Summary Bar Plot (Ozone and Sulfur Dioxide)	Aqbar.exe
Wind Rose Plot	Aqrose.ese
Three-year Summary Plot	Aqsumm.exe
Stackplot	Stkwin.exe

To generate any of the plots except Stackplot:

- Select the desired graphics product from the "Plots" menu in the AQDBMS
  -or-
  Double click the icon for the desired graphics product on the Windows desktop.

- Set up the printer:
  - Choose **Select Printer** item from the "File" menu.
  - Select the desired printer destination.
  - Set the paper orientation for the current graphic product (all are portrait except the Data Summary Bar Plot which is landscape).
- Select a site from the "Select Site" drop-down list box.
- Enter the start and end dates for the period to be plotted in the "Start" and "End" boxes.
- If plotting an annual period as four quarterly plots on a single page, check the **Quarterly Plots** box.
- Click the **Get Parameter List** button. The program retrieves a parameter code list for the selected site/period.
- Select the parameter to be plotted from the "Available Parameter List" drop-down list box.
- If you want the plot to print automatically, click the **AutoPrint** checkbox.
- Click the **Draw Plot** button. The program retrieves and plots the data.
- If needed, modify the default graph scaling values, then click the **Redraw** button.
- Click the **Print** button to print the plot.

Plots can be created for multiple sites/parameters for the same period. To create multiple plots in a single run, a submit file containing a list of the sites/parameters to be plotted is created in advance. The sites/parameters included in a submit file will be plotted with common options. Sites with parameters that do not use common options--such as a scaling change--must be run in single site mode. Create separate submit files for each of the graphics products.

To create a submit file:

- Open a new file in a text file editor such as Windows Notepad (**do not** use a word processor such as Word for Windows).
- On the first line of this file:
  - Type a four-character site abbreviation followed by a comma.
  - Type a parameter abbreviation followed by a hyphen and a comma.

- Type a **Y** followed by a comma.

- Type three more commas, then press **Enter.**

For example, type **BIBE,O3-,Y,,,,** to plot ozone data for Big Bend.

- Repeat step 2 for each combination of site/parameter that you want to include in the batch of plots.

- Select **Save As** from the "File" menu. Save the file in the folder \\ars net3\project\npsair\sitecall\annual\batch.

To create plots for multiple sites:

- Select the desired graphics product from the "Plots" menu in the AQDBMS

  -or-

  Double click the icon for the desired graphics product on the Windows desktop.

- Set up the printer:

  - Choose **Select Printer** item from the "File" menu.

  - Select the desired printer destination.

  - Set the paper orientation for the current graphic product (all are portrait except the One-Year Summary plot which is landscape*).*

- Enter the start and end dates for the period to be plotted in the "Start" and "End" boxes.

- If plotting an annual period as four quarterly plots on a single page, check the **Quarterly Plots** box.

- If you do not want plots to print automatically, click the **AutoPrint** checkbox to deselect the auto-printing feature.

- Select **Run a Submit File** from the "File" menu.

- Select the submit file you previously created from the file-open dialogue box and click **OK**.

To generate the required Stackplots for each annual data summary report, the following files are required:

- An ASCII data file containing the yearly data for the site.

- A *stk* file containing the Stackplot configuration information for the site.

To generate a Stackplot:

- Launch STKWIN.exe from either the Windows desktop or from the "Stackplot" command of the "Plots" menu in the IMC application.

- Select **File/Open** and choose a *stk* file from the correct directory.

- Click **Start.**

- Click **Print** to send a hard copy of the plot to the printer.

To generate Stackplots using a submit file:

- Launch STKWIN.exe from either the Windows desktop or from the "Stackplot" command of the "Plots" menu in the IMC application.

- Select **File/Open** and choose a *sbm* file.

- Click **Start.**

- **C**heck **Autoprint** and **Continuous**.

- Click **Draw**.

For more information on generating plots, see the *AQDBMS User's Guide* (ARS, 1997).

4.3.4 Generating Report Text Pages

Text pages in the annual data summary reports are standardized except for Section 1.2 that describes the specific site the report is for. All text pages are generated in Microsoft Word97 word processing software. The standard pages include:

- Section 1.1 The National Park Service Gaseous Pollutant Monitoring Network

- Section 2.2 Overview of the Data Summary Section

- Section 3.1 Guide to Attached Data Disks

- Section 3.2 Other Sources for Retrieving National Park Service Gaseous Pollutant Data

- Section 4.1 Definitions and Computational Procedures for National Park Service Quick Look Annual Summary Statistics Table

- Section 4.2 Air Quality Glossary

4.3.5 Generating Report Maps

Three standard maps are included in the annual data summary report:

- Map of National Park Service Gaseous Pollutant Monitoring Network Ozone and Sulfur Dioxide Monitoring Sites
- Map of National Park Service Gaseous Pollutant Monitoring Network Ozone and Sulfur Dioxide Monitoring Sites
- Second Highest 1-Hour Ozone Concentrations

These maps are generated by importing the longitude and latitude coordinates of each site from the AQDBMS Site Configuration table into MapViewer mapping software. The site locations are plotted on a map of the United States. For the first map, a variety of symbols are applied to the plotted points to indicate different types of site configurations. For the second map, the second highest ozone concentration in parts per billion (ppb) is given for each site. The rank of each concentration is visually represented by the size of the plotted point.

Each report also includes a site specification page for the site the report is for. This page includes:

- A scanned image of a topographic map of the site location and surrounding area.
- A small insert of a state map indicating the location of the site within the state.
- A scanned image of a photograph of the site installation.
- The site coordinates, abbreviation, AIRS codes, instrumentation list, and map information.

The scanned images are created using a high-resolution, flat-bed scanner and scanning software. The pieces are then assembled in Microsoft Word97.

4.4 REVIEWING REPORTS

A report review form is attached to each report and is used to log comments and error corrections to the reports and/or data during the review process. An example report review form is shown in Figure 4-1.

Each annual data summary report is reviewed by at least three IMC staff people. If errors are found, corrections are made and the affected report contents regenerated. After the review period is complete, the report review form is removed from the report and filed in the IMC for six months.

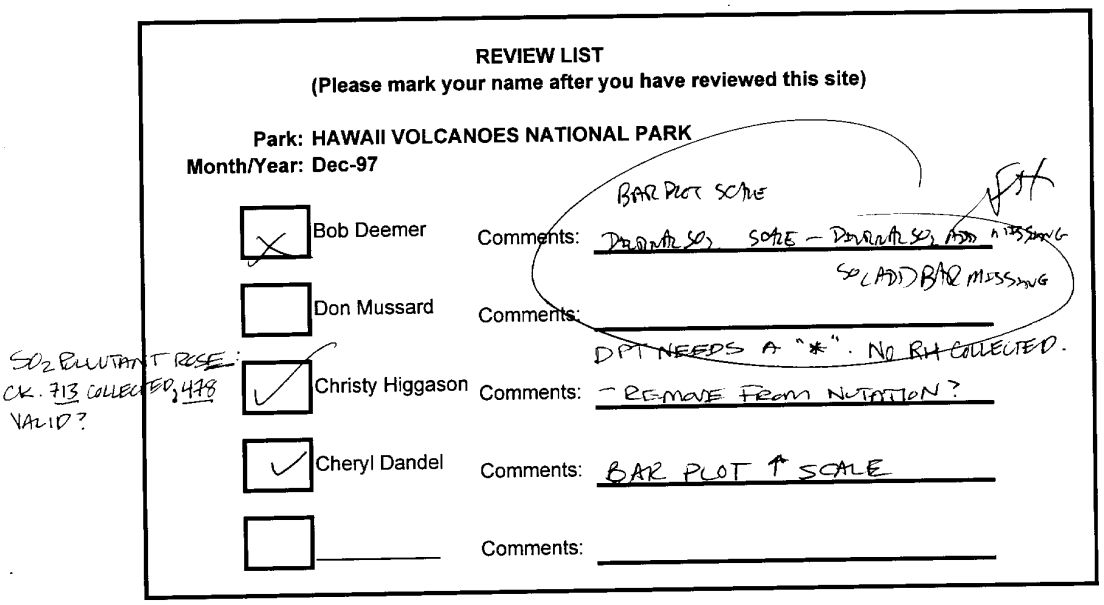

Figure 4-1. Example Report Review Form.

4.4.1 Generating Digital Data Products

The following products are generated for inclusion with annual data summary reports:

- One file per site/month containing data for all parameters in fixed width columns. These files are generated by the "Fill Data Request" program in the AQDBMS. See Section 8.0, *Filling Data Requests* in the *AQDBMS User's Guide* (ARS, 1997) for instructions.

- One file per site/month/parameter containing the data value or validation code for each data point in a table where the days are rows and the columns the hours of the day. Hourly, daily, and monthly statistics are included. These files are generated by the selecting the "Monthly Grids for Selected Parameters" option in the "Batch Printing" program in the AQDBMS. See Section 6.0, *Output Products* in the *AQDBMS User's Guide* (ARS, 1997) for instructions.

- Five rose plot frequency distribution files (containing annual, quarter 1, quarter 2, quarter 3, or quarter 4 data) per site/parameter where parameter is wind speed, ozone, or sulfur dioxide. See Section 6.3.4, *Plot-Specific Options in the AQDBMS Graphics Programs*, in the *AQDBMS User's Guide* (ARS, 1997) for instructions.

4.5 DISTRIBUTION

The unbound original pages and one bound copy of each annual data summary report are filed in the IMC. The originals are kept on file in the IMC permanently. Eleven copies of each report are made. In addition, four CD-ROMs containing all digital data products for all sites and five 3.5" high-density diskettes for each site containing the digital data products for the site are created. The reports, CD-ROMs, and diskettes are distributed as detailed in Table 4-1:

Table 4-1

Report Product Distribution

Recipient	Unbound Report	Bound Report	CD	Diskette
Site operator		1		
Park superintendent		2		1
NPS ARD	1	2	2	
NPS Regional Air Quality Coordinator		1		3
TIC (NPS Clearinghouse)	1			
Non-NPS Agency Site Operators		1		1
IMC Contractor (ARS)	1	1	2	
Totals	3	8	4	5

5.0 REFERENCES

Air Resource Specialists, Inc. (ARS), 1997, AQDBMS User's Guide.

Air Resource Specialists, Inc.
1901 Sharp Point Drive, Suite E
Fort Collins, CO 80525
Phone: 970-484-7941
Fax: 970-484-3423

QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	**HANDLING AMBIENT AIR QUALITY AND METEOROLOGICAL DATA REQUESTS**
TYPE	**TECHNICAL INSTRUCTION**
NUMBER	**3550-5200**
DATE	**MARCH 1998**

AUTHORIZATIONS		
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PROJECT MANAGER	Donald E. Mussard	
PROGRAM MANAGER	David L. Dietrich	
QA MANAGER	Gloria S. Mercer	
OTHER		

REVISION HISTORY			
REVISION NO.	CHANGE DESCRIPTION	DATE	AUTHORIZATIONS

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1.0 PURPOSE AND APPLICABILITY

This technical instruction (TI) describes the procedures and methods used by the National Park Service (NPS) Information Management Center (IMC) for handling data requests for ambient air quality and meteorological data. Ambient air quality and meteorological data are requested by various persons to meet various objectives. An example of a data request is:

> "Provide monthly data files containing scalar wind speed, vector wind direction, relative humidity, and temperature for Mammoth Cave National Park from January 1991 through August 1992. Place the files on the ARS ftp site for download."

The IMC has developed steps for handling data requests to ensure that high quality data are readily available to fill these requests. This TI is referenced from SOP 3550, *Ambient Air Quality and Meteorological Data Reporting*.

2.0 RESPONSIBILITIES

2.1 DATA COORDINATOR

The data coordinator shall:

- Handle all data requests.
- Communicate with the NPS Air Resources Division (ARD) regarding data requests.

2.2 DATA ANALYST AND DATA TECHNICIAN

The data analyst and data technician shall assist the data coordinator with data requests as needed.

2.3 TECHNICAL ASSISTANT

The technical assistant shall:

- Help prepare supporting documentation and/or correspondence related to data requests.
- Mail/ship data requests to the recipient as needed.

2.4 DATABASE ADMINISTRATOR/PROGRAMMER

The database administrator/programmer shall create custom data summaries, data listings, or graphics, for data requests requiring non-standard output.

3.0 REQUIRED EQUIPMENT AND MATERIALS

Microsoft Word for Windows 97 is used to word process text portions of supporting documentation and correspondence. Typically, the data files, report tables, or graphics needed to fill data requests are generated by programs in the Air Quality Database Management System (AQDBMS).

3.1 THE AIR QUALITY DATABASE MANAGEMENT SYSTEM (AQDBMS)

The Air Quality Database Management System (AQDBMS) is the primary tool used to validate ambient air quality and meteorological data. The Air Quality Database Management System (AQDBMS) is comprised of two main components:

- An Oracle database specifically designed and developed by Air Resource Specialists (ARS) to hold air quality network data and to accommodate the many temporal, spatial, and functional variations found within an air quality network.

- Customized software programs developed by Air Resource Specialists that provide an interface to the Oracle database.

3.1.1 System Hardware Requirements

The AQDBMS requires the following hardware:

- Workstations - Networked Intel Pentium-based workstations with at least 16MB of RAM (32MB recommended), 1024 x 768 resolution (recommended large fonts, 17 inch or larger monitor), 40MB of available hard disk space, and a mouse.

- Database Server - An Intel Pentium-based database server with hard disks providing at least 2 gigabytes of storage and at least 48MB of RAM, color monitor, mouse, CD-ROM, and back-up device.

- Reporting - High-resolution laserjet or inkjet printer for printing.

3.1.2 System Software Requirements

The AQDBMS requires the following commercial software:

- PC operating system - Microsoft Windows95.

- Network operating system - Novell Netware 3.12 or 4.11; IPX protocol.

- Database engine - The Oracle 7 (version 7.2 or 7.3) Workgroup Server for Netware Relational Database Management System (RDBMS).

- Database connectivity - Oracle SQL*Net (version 2.2 or 2.3) IPX protocol adapter. Oracle ODBC Driver for Oracle version 2.05 or later.

- User interface - Powersoft PowerBuilder version 5.0.02 run-time libraries. Microsoft VisualBasic version 5.0 run-time libraries.

The AQDBMS requires the following ARS-developed software:

- User interface for loading, screening, validation, reporting, creation of AIRS files, etc. – PowerBuilder executables (ESD.exe and .PBD files). VisualBasic executables (vbrose32.exe, diur32.exe, vbbar32.exe, stkwin.exe vbsum32.exe).

4.0 METHODS

Data requests are received by the ARD or IMC and forwarded to the IMC data coordinator to fulfill. This section contains the following five (5) major subsections, which detail the steps taken to complete data requests:

4.1 The Data Request Form
4.2 Authorization of Data Requests
4.3 Generating Data Files for Data Requests
4.4 Other Types of Data Requests
4.5 Delivering Data Requests

4.1 THE DATA REQUEST FORM

The Data Request Form is used to log all pertinent information about an individual data request. An example completed Data Request Form is shown in Figure 4-1. The IMC staff person receiving the request fills in the request information on the form. It is then forwarded to the data coordinator. The data coordinator completes the form as the data request is processed. The completed form is permanently filed in the IMC.

4.2 AUTHORIZATION OF DATA REQUESTS

The NPS ARD must authorize each data request before processing the request. Data requests made via the NPS ARD have an implied authorization. Otherwise, details of the data request are forwarded to the NPS ARD by phone, e-mail, or fax. Authorization is returned to the IMC also by phone, e-mail, or fax. Authorization is noted on the Data Request Form.

Some data requests can be unusually complex or require large volumes of data or non-standard output. In these cases, the data coordinator must estimate the amount of time and materials needed to fill the request and communicate this information to the NPS ARD. Doing so will allow the ARD to judge if filling the request is an appropriate use of the data coordinator’s time or if the scope of the request needs to be negotiated with the requester.

Air Resource Specialists, Inc.

Date 5/2/97

DATA REQUEST

By John Faust To Edie Forward To

Name Carl Key Authorization Dave Joseph

Affiliation Glacier National Park Purpose

Address carl_key@nps.gov
or
carl-key@usgs.gov

Phone (406) 888-7991

Date needed by Charge To NPSIMC3-ORIG

Request details All parameters Jan95 - March 95
(GLAC95.DAT)

Date Completed 5/5/97 Shipped Via e-mail

Notes Zipped letter, attachment, and data into GLAC195.ZIP. e-mailed that.

Figure 4-1. Example Data Request Form.

4.3 GENERATING DATA FILES FOR DATA REQUESTS

Writing a subset of data from the AQDBMS database to an ASCII (American Standard Code for Information Interchange) file satisfies most data requests. Only final data are used to fill a data request, unless special permission to use preliminary data has been granted by the NPS ARD. The interface for generating these files allows the data coordinator to select the sites, time period, parameters and validation level to use for the data set. Output options allow the creation of monthly site files or one file with all data for the selected site.

To generate ASCII data files:

- Select **Fill Data Requests** from the "Export" menu.
- Select sites from the "Site" list:

  To select all sites, click the **add all** button.

  To select a group of sites from the list, click on the first site in the group then hold down the shift key and click the last site. The two clicked sites and all sites in between will be selected. Click the **add** button.

  To select multiple sites not in a group, click on the first site you want then hold down the control key as you click additional sites. Click the **add** button.

- Select parameters from the "Parameters" list. Use the same methods for selecting as in step 2.
- Select the beginning month and year of the data set to use.
- Select the ending month and year of the data set to use.
- Select the "through final validation" option by clicking the **option** button to include only final validation level data.

  -or-

  Select the "through preliminary validation" option by clicking the **option** button to include final and preliminary validation levels of data.

  Note A header is written to each file specifying the level of validation of the data contained within the file.

- Select the "create one file per site" option by clicking the **option** button to create only one file per site. Only one file per selected site is created and is named xxxx.dat (xxxx is the file abbreviation as defined in the Site Configuration Table.)

-or-

Select the “create one file per site/month” option by clicking the **option** button. A file for each site for each selected month and named xxxxyymm.dat (xxxx is the file abbreviation, yy the last two digits of the selected year, and mm the month number.)

- Click the **Create File** button.

The files are written to the \\ars_net3\project\npsair\dpc\data_req directory. A message displays if a file already exists. Answer "Yes" to append or "No" to overwrite.

After the files have been created, the data coordinator reviews the files using a text editor to verify that they were created correctly. If large portions at the beginning or end of a file contain nothing but invalid values (usually due to the instrument not being installed during those times), these lines are deleted and the dates at the top of the file modified to reflect the change. This reduces the size of the file and the amount of effort the recipient will need to find data.

4.4 OTHER TYPES OF DATA REQUESTS

Some data requests may include requests for standard monthly or annual report tables or plots. Standard output can be generated by AQDBMS application at any time. Refer to TI 3550-5000, *Ambient Air Quality and Meteorological Data Monthly Reporting,* TI 3550-5100, *Ambient Air Quality and Meteorological Data Annual Reporting* or *The AQDBMS User’s Guide* (ARS, 1997) for instructions on generating standard output.

Data requests may also include requests for custom data summaries or lists meeting certain criteria or graphics. In these cases, the data coordinator works with the database administrator/programmer to generate the necessary output.

4.5 DELIVERING DATA REQUESTS

Hard copy data requests are mailed or faxed to the recipient. Digital data requests are delivered in one of the following ways depending on the volume of data and/or how the recipients want to receive the data:

- Written to 3.5” floppy disk(s) and mailed.
- Written to CD-ROM and mailed.
- Transmitted via an e-mail attachment.
- Downloaded by the recipient from the ARS ftp site.

If data files are written to floppy disks or CD-ROM:

- The data coordinator copies the files to the appropriate media and labels each piece as to its contents.

- The disk(s) and shipping information for the recipient are forwarded to the technical assistant who generates a cover letter from the standard form in \\ars_net3\ project\npsair\data_req\masterlt.doc and the standard attachment from \\ars net3\project\npsair\dpc\data_req\masterat.doc.

- The data coordinator signs the letter and the package is sent first class mail unless directed otherwise by the ARD.

If the data files are transmitted via an e-mail attachment:

- A text file version of the cover letter and standard attachment (\\ars_net3\ project\npsair\data_req\masterlt.txt and \\ars_net3\ project\npsair\data_req\masterat.txt) is used to create an e-mail message.

- The data file(s) are attached to the e-mail message and the message sent.

- The message requests a response from the recipient regarding if the data request was successfully received or not. If a response is not received within three working days, the data coordinator follows up with a telephone call to the recipient.

If the data files are to be downloaded from the ARS ftp site:

- The files are uploaded to the site.

- A text file version of the cover letter and standard attachment (\\ars_net3\ project\npsair\data_req\masterlt.txt and \\ars_net3\ project\npsair\data_req\masterat.txt) is used to create an e-mail message. The message also includes instructions for downloading the files.

- The message is sent.

- The message requests a response from the recipient regarding if the data request is successfully downloaded or not. If a response is not received within three working days, the data coordinator follows up with a telephone call to the recipient.

- The files are removed from the ftp site after it is confirmed that the recipient has successfully retrieved them.

After the request is completed and delivered, copies of any related documentation, including cover letters, attachments, and e-mail messages, are attached to the completed data request form and filed. The data request is also logged in an Excel spreadsheet file located in \\ars_net3\project\npsair\dpc\reqstsyy.xls where yy is the contract year. The first sheet in the Excel workbook lists all requests filled during the contract year. Each subsequent sheet represents one month of data requests for the year.

5.0 REFERENCES

Air Resource Specialists, Inc. (ARS), 1997, AQDBMS User's Guide.

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1.0 PURPOSE AND APPLICABILITY

This technical instruction (TI) describes the procedures and methods used by the National Park Service (NPS) Information Management Center (IMC) for submitting data to the Environmental Protection Agency's (EPA) Aerometric Information Retrieval System (AIRS) database. These data include hourly average ambient air quality and meteorological data, precision data from criteria pollutant analyzer precision checks, and accuracy data from audit reports on criteria pollutant analyzers.

All data and associated AIRS codes required for creating AIRS transactions are stored in the Air Quality Database Management System (AQDBMS). computer programs within the AQDBMS create the AIRS transaction files and data are submitted on a quarterly basis after all data for the quarter are at the final validation level. This TI is referenced from SOP 3550, *Ambient Air Quality and Meteorological Data Reporting*.

2.0 RESPONSIBILITIES

2.1 DATA COORDINATOR

The data coordinator shall:

- Maintain the required AIRS codes for all sites and parameters within the monitoring network within the AQDBMS and in AIRS.
- Be adequately trained in operating the EPA AIRS interface and be familiar with the set of EPA issued AIRS documentation.
- Be responsible for generating and submitting hourly ambient and meteorological data and precision and accuracy data to the EPA AIRS on at least a quarterly basis.

2.2 DATA ANALYST AND DATA TECHNICIAN

The data analyst and data technician shall assist the data coordinator with generating and submitting hourly ambient and meteorological data and precision and accuracy data to the EPA AIRS database.

3.0 REQUIRED EQUIPMENT AND MATERIALS

3.1 THE AIR QUALITY DATABASE MANAGEMENT SYSTEM (AQDBMS)

The Air Quality Database Management System (AQDBMS) is the tool used to create AIRS transaction files for ambient air quality and meteorological data. The AQDBMS is comprised of two main components:

- An Oracle database specifically designed and developed by Air Resource Specialists (ARS) to hold air quality network data and to accommodate the many temporal, spatial, and functional variations found within an air quality network.

- Customized software programs developed by Air Resource Specialists that provide an interface to the Oracle database.

3.1.1 System Hardware Requirements

The AQDBMS requires the following hardware:

- Workstations - Networked Intel Pentium-based workstations with at least 16MB of RAM (32MB recommended), 1024 x 768 resolution (recommended large fonts, 17 inch or larger monitor), 40MB of available hard disk space, and a mouse.

- Database Server - An Intel Pentium-based database server with hard disks providing at least 2 gigabytes of storage and at least 48MB of RAM, color monitor, mouse, CD-ROM, and back-up device.

- Reporting - High-resolution laserjet or inkjet printer for printing.

3.1.2 System Software Requirements

The AQDBMS requires the following commercial software:

- PC operating system - Microsoft Windows95.

- Network operating system - Novell Netware 3.12 or 4.11; IPX protocol.

- Database engine - The Oracle 7 (version 7.2 or 7.3) Workgroup Server for Netware Relational Database Management System (RDBMS).

- Database connectivity - Oracle SQL*Net (version 2.2 or 2.3) IPX protocol adapter. Oracle ODBC Driver for Oracle version 2.05 or later.

- User interface - Powersoft PowerBuilder version 5.0.02 run-time libraries. Microsoft VisualBasic version 5.0 run-time libraries.

The AQDBMS requires the following ARS-developed software:

- User interface for loading, screening, validation, reporting, creation of AIRS files, etc. – PowerBuilder executables (ESD.exe and .PBD files). VisualBasic executables (vbrose32.exe, diur32.exe, vbbar32.exe, stkwin.exe vbsum32.exe).

3.2 COMMUNICATIONS REQUIREMENTS

Submitting data to AIRS requires connecting directly to AIRS in two different ways:

- An Internet connection for using FTP (file transfer protocol) software to transfer the AIRS files from the IMC to AIRS. This can be a direct connection or a model connection through an Internet service provider.

- A terminal emulation connection for logging into AIRS and issuing the necessary commands for loading, screening, and locking the transaction files for update to the AIRS database. This can be a direct Internet connection using Telnet software or a direct dial modem connection.

3.3 EPA AIRS TRAINING AND DOCUMENTATION

The EPA provides regularly scheduled training sessions on the EPA AIRS. The data coordinator will attend training sessions as needed to keep skills and knowledge current. In addition, the IMC holds a complete set of EPA issued documentation on AIRS. The data coordinator is familiar with and will use this documentation as a supplement to this TI and when working within AIRS.

4.0 METHODS

Data are submitted to AIRS on a quarterly basis no later than 30 days after the data are at the final validation level. The data include hourly average ambient air quality and meteorological data, precision data from criteria pollutant analyzer precision checks, and accuracy data from audit reports on criteria pollutant analyzers.

This section contains the following three (3) major subsections, which detail the steps taken to complete data submittal to AIRS:

4.1 Generating AIRS Files From the AQDBMS
4.2 Transferring an AIRS File to AIRS
4.3 Preparing Submit Files for Update to the AIRS Database

The steps required to submit data to the EPA AIRS database are:

- Create the AIRS transaction files for hourly average ambient air quality and meteorological data.

- Create the AIRS transaction files for precision data from criteria pollutant analyzer precision checks (typically one per week per site/analyzer).

- Create the AIRS transaction files for accuracy data from audit reports on criteria pollutant analyzers (typically one every 6 months to one year per site/analyzer).

- Transfer the files to AIRS using FTP (file transfer protocol).

- Load data into the AIRS screening file(s), successfully run the AIRS edit programs, and lock the screening file(s) for update to the AIRS database.

4.1 GENERATING AIRS FILES FROM THE AQDBMS

4.1.1 Hourly Average Files

Hourly average ambient air quality and meteorological data must be formatted as AIRS Type 1 transactions to be submitted to AIRS. A program in the AQDBMS generates Type 1 transaction files.

To generate transaction Type 1 AIRS files:

- Select **AIRS Submit Files** from the "Export" menu.
- Select the beginning month and year of the data set to use.
- Select the ending month and year of the data set to use.
- The "Site List" box is filled with site abbreviations of the sites that have one-hour average data for the time period selected.
  - To select all sites, click the **add all** button.
  - To select a group of sites from the list, click on the first site in the group then hold down the shift key and click the last site. The two clicked sites and all sites in between will be selected. Click the **add** button.
  - To select multiple sites not in a group, click on the first site you want then hold down the control key as you click additional sites. Click the **add** button.
  - To remove a site from the selected list click the site then click the **remove** button.
- Select parameters. Use the same methods for selecting as above.
- Click the **Create File** button.

A file called AIRS.DAT is written to the \\ars net3\vol2\project\npsair\dpc\airs directory. A message displays if the file already exists. Answer "Yes" to append to the existing file or "No" to overwrite the existing file.

Notes:

- The program looks up each selected site in the Site Configuration Table. This is where the AIRS site code (state, county, and site number) is stored. If this information is not filled in, a message is displayed and that site will not be written to the AIRS data file. If the information is wrong, problems will occur in AIRS.
- If a site does not exist for the entire period that was selected, only the period when valid data exist will be written to the file (i.e., nothing will be written for the times when there are no data). Likewise, if a parameter is chosen and a site does not have that monitor, then that parameter will be skipped.

- Each parameter's associated AIRS code, method code, and POC code is defined in the parameter codes table, under table maintenance.

4.1.2 Precision Data AIRS Files

The weekly precision checks conducted on criteria pollutant analyzers within the network are submitted to AIRS as precision or Type 7 transactions. A program in the AQDBMS generates Type 7 transaction files.

To generate transaction Type 7 AIRS files:

- Select **Precision Submit Files** from the "Export" menu.
- Enter the quarter (1 for winter, 2 for spring, 3 for summer, 4 for fall, or 0 for the entire year) of the data set to use.
- Enter the year to use (in yyyy format). The precision checks window is displayed.
- Click the **arrow** in the "Site" box and select a site. A list of precision checks for the selected site/period is displayed.
- Select the records to write to the AIRS file by clicking the box in the "Submit to AIRS" column to toggle the check mark on and off. The selected sites records should represent a precision check difference of within 15%.
- Click the **Write to File** button.

A file called PARS.DAT is written to the \\ars net3\vol2\project\npsair\dpc\airs\pars directory. A message displays if the file already exists. Answer "Yes" to append to the existing file or "No" to overwrite the existing file.

4.1.3 Accuracy Data AIRS Files

Data from annual or semiannual audits conducted on criteria pollutant analyzers within the network are submitted to AIRS as accuracy or Type 8 transactions. A program in the AQDBMS generates Type 8 transaction files.

To generate transaction Type 8 AIRS files:

- Select **Accuracy Submit Files** from the "Export" menu.
- Enter the quarter (1 for winter, 2 for spring, 3 for summer, 4 for fall, or 0 for the entire year) of the data set to use.
- Enter the year to use (in yyyy format). The accuracy data window is displayed containing the records for all sites found with accuracy data for the selected period.

- Select the records to write to the AIRS file by clicking the box in the “Submit to AIRS” column to toggle the check mark on and off.

- Click the **Write to File** button.

A file called AUDIT.DAT is written to the \\ars net3\vol2\project\npsair\dpc\airs\pars directory. A message displays if the file already exists. Answer "Yes" to append to the existing file or "No" to overwrite the existing file.

4.2 TRANSFERRING AN AIRS FILE TO AIRS

Once the AIRS data file is generated, the file is now ready to be sent to the AIRS mainframe. To transfer that file, use the program named “FTP”, which is included with any copy of Windows 95.

To transfer an AIRS file using FTP:

- Click on the “FTP” Icon.

- A screen similar to a DOS prompt is displayed, except with an FTP prompt that looks like: ftp>

- At the FTP prompt, connect to the AIRS mainframe by typing **open epaibm.rtpnc.epa.gov,** then press the **Enter** key. This is the Internet address of the AIRS system. Some header information will be displayed including the time and date of the connection. Enter your “AIRS userid” when prompted and press **Enter**.

- Enter your “AIRS password” and press **Enter**. If everything was entered correctly, a message is displayed stating that you are now logged in and displaying your working directory.

  Note If your information was entered incorrectly, the mainframe will tell you that the logon was rejected. You will need to type the following command at the FTP prompt: **user <userid>**. The “user” command tells the remote system that you are going to logon as this user. Then, enter your password again.

- If you are sending an ASCII file, **type quote “site recfm=fb lrecl=80 blocksize=6160 primary=58 secondary=50 cy”**, then press **Enter.**

  -or-

  If you are sending a zipped file (a compressed file with a .zip file extension), type **quote “site recfm=u lrecl=6160 blocksize=6160 primary=58 secondary=50 cy”**, then press **Enter.** If the line was type correctly, it should respond with: “200 Site command was accepted.”

- If you are sending an ASCII file, type **type ascii**, then press **Enter.**

  -or-

  If you are sending a zipped file, type **type binary**, then press **Enter.**

- Type **lcd <path>** where <path> is the location of the AIRS file on your computer or file server. For example, \\ars net3\vol2\project\npsair\dpc\airs is the default directory for primary data.\

- Type **put <filename>** where <filename> is the name of your AIRS data file. For example, Y97Q1.DAT.

- After a few seconds (or minutes depending on how large the file is) the FTP prompt will return and tell you that the transfer was successful.

- Type **close** to disconnect from the AIRS mainframe.

- Type **quit** to end the FTP session.

  Note: The commands in steps 5 and 6 tell the mainframe some details about the file that you are about to send. Know which type of file you are sending and do not skip these steps because the mainframe will not be able to correctly read the file if you do.

4.3 PREPARING SUBMIT FILES FOR UPDATE TO THE AIRS DATABASE

There are four general steps in the process of preparing a submit file for update to the main AIRS database. All of these steps take place while you are logged in to the AIRS mainframe. This section summarizes the processes of loading and editing data in the screening file in AIRS. The process of setting up multiple sessions in AIRS to facilitate the editing process is also included in this section.

4.3.1 Loading Data into the Screening File

Each data set to be updated to the AIRS database must be loaded into the screening file. To load data into the screening file:

- Log into AIRS.

- At the main AIRS menu, select option **1** (Air Quality Subsystem).

- Enter the screening file password (**hack**).

- Tab to the appropriate screening file (O88AQD01 or O88AQD02 for hourly data, O88AQDSI for site and/or monitor data), type **S** next to the screening file name, then press **Enter.**

- A menu with six options is displayed. Select option **1** (Submit Data). Another menu is displayed.

- Select option **1** (Load Data). The next screen is displayed and prompts what dataset you want to load into the screening file. Type the account qualifier and dataset name in single quotes, then press **Enter**. The dataset name will be the same as the file name uploaded in Section 3.0. For example, **'BFBNPSD.MAY97.DAT'**.

- Write down the job number for reference, in case an error occurs.

- Select option **5** (Check Messages) to check messages for the screening file. If the load is still processing, the message displayed will be: "Load failed - A system error occurred." When the load process finishes, it will display a message similar to: "Loaded 0013563 records into screening file O88AQD01."

- Repeat the last three steps if you need to load more than one dataset into the screening file.

4.3.2 Editing Data in the Screening File

Once the data have been successfully loaded into the screening file, it is ready to be edited for errors. To edit data in the screening file:

- Select option **2** (Edit Screening File).

- Select a Level **2** edit (the default is always Level 3), then press **Enter**.

- Write down the job number displayed for reference.

- Select option **5** (Check Messages) to find out when the edit is completed. When completed, you will hopefully see a line similar to:
  "Edited 00013563 records in screening file O88AQD01
  L0 = 00000000 L1 - 00000000 L2 = 00013563 All = 00000000."
  This means that all 13563 records passed to Level 2

  -or-

  If there are errors in the file, you'll see a line similar to:

  "Edited 00013563 records in screening file O88AQD01
  L0 = 00000645 L1 - 00000013 L2 = 00012905 All = 00000000."

  This means that 12905 records passed to Level 2, 13 passed to Level 1 (i.e., failed the Level 2 edit), and 645 are at Level 0 (i.e., failed both Level 1 and Level 2 edit). See Section 4.3.3, Fixing Errors in the Screening File.

- If all records passed to Level 2, repeat these steps for Level 3.

- When completed, you should see a line similar to:

  "Edited 00013563 records in screening file O88AQD01
  L0 = 00000000 L1 - 00000000 L2 = 00000000 All = 00013563."

  This means that all 13563 records passed to Level 3 and the file is ready for update. If not all records passed to Level 3, see Section 4.3.3, Fixing Errors in the Screening File.

4.3.3 Fixing Errors in the Screening File

To fix errors in the screening file:

- Log into TSO.

- Log into ISPF.

- In ISPF, type **SDSF**. SDSF is where you check the output of any job that has run (Loads, Edits, Deletes, etc.). The output should be in the "Output Queue".

- Select the appropriate job number by pressing the **tab** key until the cursor is next to the correct job and type **S**. You can press **F8** to scroll through the output.

- After determining what caused the errors, log into AIRS and go back to the main submit menu.

- Select option **3** (Correct Mode), then press **F9** (Global Correct Mode), if necessary.

- Fix the transactions that have errors. See the AIRS documentation for complete instructions on correcting data in the screening file.

- After correcting the errors, perform additional Level 2 and/or Level 3 edits and repeat these steps to fix errors until all records pass to Level 3.

4.3.4 Locking the Screening File for Update

After all records in the screening file have passed to Level 3, the screening file is ready to be locked for update. To lock the screening file for update:

- Select option **4** from the submit menu.

- Select **Notify AIRS database administrator for update.**

  At this point, the screening file is locked and will be read from and updated to the AIRS database on the next Monday at 4:00 p.m. Eastern time.